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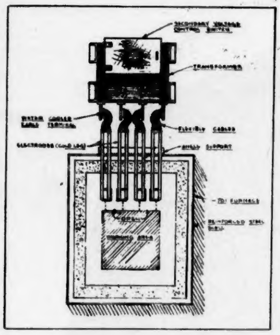

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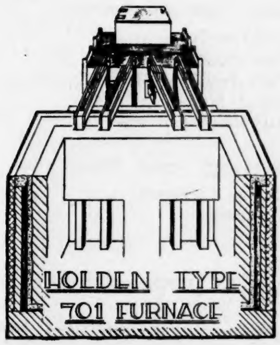

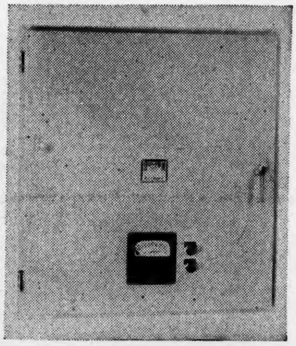

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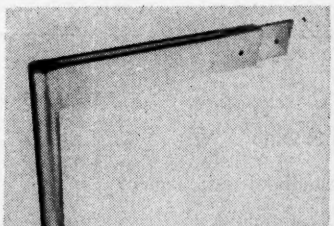

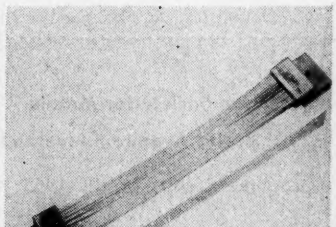

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Metals Review

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IMPORTANT LECTURES

DEPARTMENTS

ASM REVIEW OF METAL LITERATURE

Discusses Plain and Roller Bearings

Arnold O. DeHart, General Motors Corp., Who Gave a Talk on the "Application and Performance of Plain and Roller Contact Bearings" at a Meeting Held Recently by Rochester Chapter, Is Shown, Left, With N. J. Finsterwalder, Vice-Chairman, Center, and Mort Finch, Rochester Products Div., General Motors Corp., Right. (Photograph by N. Iannone for Rochester)

Speaker: Arnold O. DeHart
General Motors Corp.

At a meeting of the **Rochester Chapter,** Arnold O. DeHart, research engineer, General Motors Corp., presented a discussion on the "Application and Performance of Plain and Roller Contact Bearings".

With the aid of unusually clear slides, Mr. DeHart concentrated his talk on bearings used to support rotary motion. The two groups into which these were divided are the hydrodynamically lubricated plain bearings in which one surface simply slides relative to the other and contact bearings in which balls or rollers permit the relative motion.

In the normal plain bearings where, in most cases, oil under pressure is fed into the bearing through an oil hole, the chief function of the lubricant is to provide load-carrying oil film and carry away excess heat as it is generated. The bearing thus acts as a pump to maintain film pressures to support the load.

Slides depicting a typical lubricated plain bearing indicated that when a machine has been idle long enough the lubricant is squeezed out from the bearing under the load pressure and when the shaft starts to rotate the friction of the journal against the bearing will be high and a certain amount of abrasion will occur. Therefore, the wear occurs in the starting operation of the unit.

Mr. DeHart went into considerable detail on the importance of this starting or boundary lubrication when the bearing and journal are rubbing together. This action results in the wearing, scoring, galling or welding of the bearing. It was pointed out that the proper selection of the bearing material becomes of extreme importance. Mr. DeHart used charts to show fatigue, corrosion and embeddability resistance of several bearing metals such as Babbitt, cadmium alloys, aluminum and low-leaded bronze.

The final factors stressed by Mr. DeHart were that for high load application the journals should be as geometrically perfect as practical and the most important property of a bearing lubricant is viscosity.

Fundamental differences and various types of rolling contact bearings were well illustrated and described and included ball, cylindrical, barrel roller and tapered roller types. Basically, very little oil is required to lubricate a ball or roller bearing except that in high-speed applications the lubricant must also serve to carry away the heat.

Mr. DeHart concluded by stating that in many cases there is no direct competition between the two types of bearings discussed. For example, in military jet engines, only ball and roller bearings are used to support the main shaft because of extreme low-temperature starting, greater freedom in alignment tolerances, etc. On the other hand, automobile engines use plain bearings because of cost, ability to withstand dynamic load and the difficult problem of application of rolling contact bearings for rods and mains because of geometry. Hence, each type has its own special qualifications and the requirements of a specific job usually dictate the choice.—**Reported by Frank J. Gehrlein for Rochester Chapter.**

Technical Report Writing Subject at Birmingham

Speaker: R. G. McWilliams
Birmingham Southern College

R. G. McWilliams, head of the department of English, Birmingham Southern College, presented a talk entitled "Technical Report Writing" at a meeting held in **Birmingham.**

Mr. McWilliams' lecture covered briefly the main divisions of a technical report, what each section should contain and numerous tips on how to make a report more readable and concise. The members of the chapter were highly interested in the points made by Mr. McWilliams and a lively "question and answer" session followed his presentation.—**Reported by Donald C. Bertossa for Birmingham.**

At Columbus National Officers Night

National President A. O. Schaefer, Vice-President in Charge of Engineering and Manufacturing, Midvale Co., Spoke on the "Forging of Steel" at the National Officers Night Meeting of the Columbus Chapter. Present were, at large table, starting from Mr. Schaefer's left: Mrs. and Mr. R. Ernest Christin; Mrs. and Mr. F. W. Boulger; J. H. Jackson and Mrs. Schaefer. Seated, at small table, starting with Mr. Eisenman, are: Dr. and Mrs. O. E. Harder; and Mrs. J. Harry Jackson. (Reported by J. H. Jackson)

Deep Drawing of Steel Cartridge Cases Topic at Chicago-Western Chapter

Speaker: S. S. Rice
Autoyre Co.

At a recent meeting of the **Chicago-Western Group** of the Chicago Chapter, S. S. Rice, chief metallurgist, Autoyre Co., spoke on the "Deep Drawing of Steel Cartridge Cases".

Almost every problem encountered in deep drawing presents itself during the manufacture of a cartridge case. These problems were greatly accentuated by a necessary conversion from brass to steel. It was only through recent advances in deep drawing techniques that a once impossible job became workable. Such advances were effected particularly in the fields of phosphate coating, dry soap lubrication, atmosphere-controlled annealing, heat treating, tool design and steel quality.

The selection of a satisfactory steel for the job was very difficult. A steel with 0.25 to 0.35% carbon, 0.60 to 0.90% manganese, and controlled limits on phosphorus, sulphur and silicon was chosen. This steel must be fine-grained, aluminum - killed, spheroidize-annealed, and with a minimum of inclusions, if it is to survive the severe deep drawing.

The success of the initial cupping operation can be influenced by many factors including steel quality, condition of blank edge, shear angle of the blank, design of the cupping punch and die and tool set-up.

Because the steel hardens to such a degree with cold working, process annealing is necessary between deep draws. Here a slightly oxidizing atmosphere is maintained. The anneal is followed by a light pickle, a zinc phosphate coat, and then a liquid soap coating which, when dry, acts as the drawing lubricant.

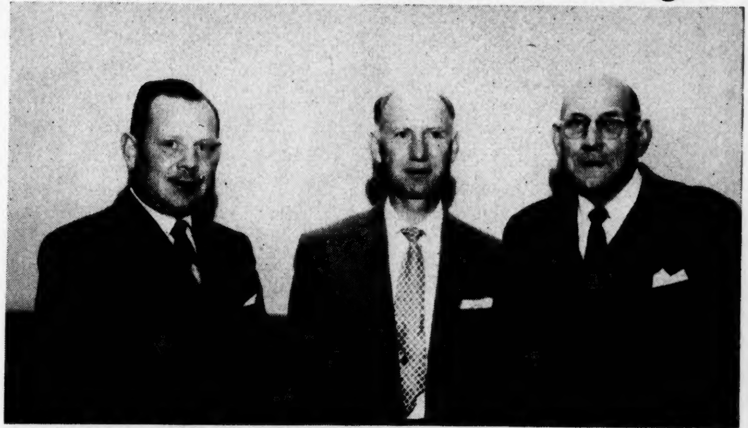
Mr. Rice went on to explain specifically what is meant by the term "deep drawing", as well as how this process differs from that known as cold extrusion, and where each of these processes is applicable.

The more interesting "finishing operations" were also discussed, including tapering, heat treating, magnetic comparator testing and coating for corrosion resistance.

The speaker concluded by pointing out that the future of the steel cartridge case is now assured. Brass cases are gradually being replaced by steel ones at least as good if not better than their brass counterparts.—**Reported by A. F. Eggleton for Chicago-Western Group.**

● prepares and distributes on request, preprints of the technical and scientific articles presented at the annual convention.

San Diego Talk on Functional Design

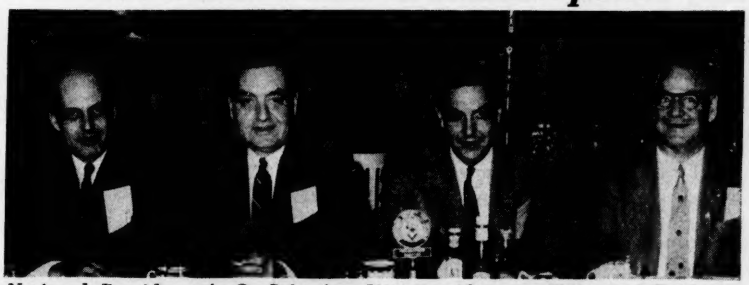


Arnold M. Small, Engineer Staff Specialist, Convair, Presented a Talk on "Human Factors in Functional Design" at a Meeting Held by the San Diego Chapter. Shown are, from left: Captain E. F. Norwood, assistant chief of surgery, Naval Hospital, who gave a coffee talk entitled "Effect of Atomic Radiation"; Dr. Small; and Commander Shively, technical chairman

Worcester Honors 25-Year Members

Twenty-Five Year Members Who Were Honored at a Recent Meeting of the Worcester Chapter Included, From Left: Lloyd G. Field, Greenman Steel Treating Co.; Eric Hirvonen, Leland-Gifford Co.; Wilbur C. Searle, Reed and Prince Manufacturing Co.; Carroll C. Tucker, Reed and Prince Manufacturing Co.; Carl G. Johnson, Worcester Polytechnic Institute; and Chester M. Inman, Consulting Metallurgical Engineer. (Photo by C. W. Russell)

President Guest at Indianapolis



National President A. O. Schaefer, Vice-President in Charge of Engineering and Manufacturing, Midvale Co., Presented a Talk Entitled "Testing and Inspecting Steel Forgings" at a Meeting of the Indianapolis Chapter. Shown at the speaker's table are, from left: Edwin E. Tuttle, vice-chairman; Mr. Schaefer; Wayne Glover, chairman; and National Secretary W. H. Eisenman, who presented a report on the Joint Metallurgical Societies Meeting held in Europe last summer. (Reported by Dorothy B. Holbrook)

Relates Testing and People at Saginaw

At a Meeting of the Saginaw Valley Chapter, F. G. Tatnall, Baldwin-Lima-Hamilton Corp., Gave a Talk Entitled "Testing, Metallurgy and People" He is shown, center, with Chairman T. L. Leontis, left, and E. H. Schuette

Speaker: F. G. Tatnall
Baldwin-Lima-Hamilton Corp.

Francis G. Tatnall, director of research of the Baldwin-Lima-Hamilton Corp., addressed the **Saginaw Valley Chapter** on the subject "Testing, Metallurgy and People" at a meeting honoring 25-year members of the Chapter.

Mr. Tatnall presented an interesting discussion on the relationship of environmental testing and automation to the advances in testing techniques and equipment and the need for close cooperation among the stress analyst, designer and metallurgist. He emphasized that automation is nothing new, but that it is the accumulation and proper combination and application of existing scientific facts and engineering techniques to solve present-day problems in a more satisfactory and efficient manner.

The 25-year members who were honored at this meeting were M. H. Medwedeff, Robert Schenck, Floyd E. Harris, H. S. Austin, F. L. Mackin and E. G. Peckham.

A movie "The Manufacture of Stainless Steel Strip" was also shown during the meeting.—**Reported by R. W. Fenn, Jr., for Saginaw Valley.**

Tool and Die Steels Described at Baltimore

Speaker: Peter Payson
Crucible Steel Co. of America

At a recent meeting of the **Baltimore Chapter,** Peter Payson, assistant director of research, Crucible Steel Co. of America, delivered a very interesting and informative talk on "Tool and Die Steels".

Mr. Payson selected five grades of tool and die steels for his heat treating discussion, and explained why the composition of each was best suited to fit it for certain applications. The analyses presented included a plain carbon toolsteel, an oil hardening steel, high-carbon, high-chromium or air hardening die steel, high speed steel and a hot work or chromium molybdenum hot work steel.

Heating of steels was first discussed and Mr. Payson stressed the importance of dissolving carbon in austenite in heating the steel for hardening. The control of heating in order to prevent grain coarsening and melting was also mentioned.

The next phase of the talk covered the cooling of the hot steel back to room temperature, and the importance of time required for cooling. T-T-T curves were reviewed and Mr. Payson pointed out the importance of cooling at a rate sufficiently rapid to prevent austenite transforming at high temperatures to ferrite and carbides. The expansion resulting from the transformation of austenite to martensite was explained as well as the manner in which cracking might occur if proper cooling precautions are not taken. Martempering was suggested as a measure to prevent cracking in cooling tool and die steels. The mechanics of austempering and the value of this treatment were also covered. The function of refrigeration in transforming austenite to martensite was discussed.

The final phase of heat treatment is tempering with the object of toughening the steel. The decrease in hardness which results with tempering is offset by the improvement in toughness. The effect of tempering temperatures on the hardness of the five steels was shown on a slide. The purpose of multiple tempering was explained and structural changes which occur where illustrated schematically.

Mr. Payson concluded by outlining the factors involved in size changes which occur in the heat treatment of tool and die steels.—**Reported by J. S. White for Baltimore.**

Form Salt Bath Institute

Edward N. Case, sales manager, Ajax Electric Co., was elected president of the newly formed Salt Bath Institute at a recent meeting in Cleveland.

Among the representatives of several manufacturers in the salt bath industry attending the meeting were, in addition to Case, Paul J. Kondla, sales manager, Metals Processing Division, American Cyanamid Co.; Ernest A. Walen, Heatbath Corp.; Jack Carey, vice-president in charge of sales, A. F. Holden Co.; Harry Martin, Detroit sales manager, E. F. Houghton Co.; Norman W. Upton, general manager and Ernest E. Elliot, sales manager, Upton Electric Furnace Co.

A membership committee was appointed to invite membership in the new trade association from all manufacturers in the salt bath field.

The second meeting of the Salt Bath Institute is Planned for Cleveland on Thursday, Apr. 26. Headquarters for the Institute have been established at 7307 Euclid Ave., Cleveland 3, Ohio.

Welcome 25-Year Members in Cleveland

C. H. Junge (Left) Is Shown Presenting 25-Year Membership Certificates to, From Left: Walter Carroll, Republic Steel Corp.; Ralph R. Leo, United States Steel Corp.; and H. C. Burgess, Representing Latrobe Steel Co.

Compliments

To MARS G. FONTANA of Ohio State University on being selected as the 156th recipient of the Speller Award of the National Association of Corrosion Engineers. Dr. Fontana's experience in corrosion work covers a 23-yr. period including two years of high-temperature research and 11 years as a metallurgical engineer with duPont. The award, presented annually in recognition of achievements in the field of corrosion engineering, was presented at the association's annual meeting in March.

♦ ♦ ♦

To RUDOLPH THIELEMANN, manager of the Stanford Research Institute's metallurgical section, on being appointed to the committee on power plants for aircraft and designated chairman of the subcommittee on power plant materials of the National Advisory Committee for Aeronautics.

♦ ♦ ♦

To WAYNE H. GLOVER, current chairman of the Indianapolis Chapter, on his appointment as vice-president in charge of engineering at Indiana Gear Works, Inc.

♦ ♦ ♦

To R. E. CHRISTIN on his very fine feature in the *CTC News* (Columbus Technical Council, Inc.), a monthly account of Columbus technical activities. Ernie rated a nice write-up in the February issue, a feature to introduce the *News'* reporters to its readers.

♦ ♦ ♦

To the CAROLINAS CHAPTER, on setting up a program of allocating one-half of all monies received from Sustaining Memberships to a fund that will be used to promote interest in the metallurgy department at North Carolina State College, with the ultimate aim that in years to come this fund will support one or more metallurgical scholarships.

♦ ♦ ♦

To TINIUS OLSEN TESTING MACHINE Co., on the occasion of its 75th anniversary. The event has been commemorated with a special issue of *Tinius Talks* which traces the development of modern testing and balancing machines.

♦ ♦ ♦

To RAY QUADT, vice-president, Hunter Douglas Corp., on being awarded a Meritorious Public Service Citation by the U. S. Navy, in recognition of development of new aluminum alloys and their application to cold forged rocket motor tubes, mechanical time fuse bodies and proximity fuses for the Navy. Mr. Quadt is a member of the Los Angeles Chapter.

Explains Cold Extrusion Process

John E. King (Left), Heintz Manufacturing Co., Who Spoke on "Cold Extrusion is Shaping Up" at a Meeting Held Recently by the New Haven Chapter, Is Shown With Edwin P. Holtberg, Vice-Chairman and Technical Chairman

Speaker: John E. King

Heintz Manufacturing Co.

At a meeting held by the **New Haven Chapter,** John E. King, Heintz Manufacturing Co., presented a talk entitled "Cold Extrusion Is Shaping Up".

Mr. King pointed out that the cold extrusion process originated in Germany in the early 1930's. Development progressed because of the necessity of devising methods for economizing in the use of metals and equipment during World War II. The process was pioneered in the United State by Heintz, and has developed to its present position in the past ten years.

A unique feature of the cold extrusion process is the use of the two basic extrusion steps, backward and forward extrusion. Cost savings are reflected by material saving, elimination of machining, high degree of surface finish, unusual shapes in a single piece, inherent improvement in strength, and suitability for high production methods with long tool life. Cold extrusion is a method of manufacture that design engineers may now consider when designing new items.

Examples of great savings possible by the use of the cold extrusion process are the production of rocket heads and artillery shells for the Government, over 40% in material savings alone.

New developments in the commercial field are encouraging. High-strength hydraulic cylinders and actuators to extremely close tolerances are being made. Various hollow bodies with flanges, varying wall thicknesses and internal and external bosses for closure cups, bushings and raceways have been made. These have been produced from not only low carbon steel but from carbon as high as 0.40% and low alloys such as 8620, 5130, 4130 and others.

Latest development is that of producing a type of hollow truck gear for the first time. Hexagonal and octagonal pieces, as well as square shapes, can be made internally or externally or both. Limitations on size are imposed only on the equipment now available for this type of work. There seem to be unlimited possibilities for the application of this process in industry.—**Reported by Kenneth L. Tingley for New Haven.**

Saginaw Hears Cermet Talk

Speaker: Lloyd D. Richardson

Wright Air Development Center

Lloyd D. Richardson, materials laboratory, Wright Air Development Center, addressed the **Saginaw Valley Chapter** on "Cermets—Ceramics and Metals".

Mr. Richardson reviewed the service requirements which led to the development of structural ceramics and high-temperature metals and their combination in the form of cermets. He discussed work being done at present at Wright which involves materials which can be used in hypersonic aircraft.

A colored movie, "Marquette Goes to the Races", illustrating on-the-spot welding technique in preparation for the Memorial Day races at Indianapolis was also shown.—**Reported by E. L. Mannings for Saginaw Valley Chapter.**

Reviews Atomic Energy Situation

From Left: N. J. Finsterwalder, Vice-Chairman; Robert A. Charpie, Oak Ridge National Laboratory, Who Gave a "Report on Atomic Power"; Leon S. Kimpal, Chairman; and Donald E. Webster, Chairman of the Rochester Chapter of the American Foundrymen's Society, Are Shown at a Meeting Held Recently by the Rochester Chapter. (Photograph by Nick Iannone)

Speaker: Robert Alan Charpie

Oak Ridge National Laboratory

Robert A. Charpie, assistant director, Oak Ridge National Laboratory, addressed a meeting of the **Rochester Chapter,** held jointly with the American Foundrymen's Society and the Superintendents and Production Supervisors Group of the Industrial Management Council at the Chamber of Commerce. His subject was "A Status Report on Atomic Power".

Stating that we are on the threshold of cashing in on the twelve-billion dollar investment we have in nuclear energy, Dr. Charpie pointed out that we not only have in our hands an ultimate weapon which has never been used but also that atomic energy has really become a touchstone to peace. It is the focal point in most discussions of world problems today and while, to all business people in the United States it has a great amount of glamour, nobody has yet made any large sums of money on it.

From an international angle, Dr. Charpie observed that we have the potential power to wipe man from the face of the earth but this may be the strongest single factor in keeping us out of war. There is no question about the fact that we are in the lead in the nuclear energy race. We have committed ourselves to develop nuclear energy for peaceful purposes in the belief that success in this enterprise will help to cement world friendship. Russia's program is apparently the largest and most ambitious outside the U. S., but from all indications their activity has been concentrated principally on the less speculative reactor types. The Soviet technology is sound and they have the facilities and personnel to advance at a rapid rate, if necessary.

Here at home, probably the main form atomic energy will take is to produce power. The control of large quantities of power is a crucial factor in expanding our economy and improving our way of life. Nuclear energy is looked upon to supplement our present and proposed power plants in order to provide the tremendous increases in electrical consumption anticipated for the next 20 years.

We have a wealth of natural fuel resources but the cost of developing these known sources will become increasingly higher. Nuclear energy is being counted upon to help us attain the additional capacity needed, at a cost which is competitive with present fuel sources.

We are doing things in the laboratory stage which someday we hope will be in general use in industry. Basically, the techniques and operations are the same as in existing technologies. This is not a new business, it is an old one with a new twist, Dr. Charpie stated. Experts in this field are not available—they must be trained—and it is hoped that we can attract a lot of the best young graduates from our colleges. Success in nuclear energy will take the best men we can recruit.

Dr. Charpie described the five types of reactors being studied by industry, the installations now being made, and the amount of additional fuel generating capacity we will need by 1980. He pointed out that we are half way through this demonstration program and the results are better than expected two years ago. Dr. Charpie, who cautioned against too much enthusiasm, is confident that, with proper knowledge and understanding of the problems involved, atomic energy will result in benefits to all.

In a comprehensive summary, Dr. Charpie declared that it is likely that within 25 years we will have as much power from nuclear energy as we have today from present sources. Nuclear energy is not a panacea for all of our troubles nor is it going to cause any great changes in our life except to increase our scope and extend our influence. We can accomplish for ourselves and others in a democratic society a better life and higher standard of living. According to Dr. Charpie, we have gone far enough along the road of atomic energy to know that success will come if we continue to slug it out along the lines of traditional technological development. We are now starting to give back to the American economy some of what we have taken out of it.

Dr. Charpie served as scientific secretary last summer in Geneva, Switzerland, at the United Nations International Conference on Peaceful Uses of Atomic Energy. Early in January of this year, he received a presentation from Vice-President Nixon, naming him one of the 10 outstanding young men of 1955 as selected by the U. S. Junior Chamber of Commerce.—**Reported by Frank J. Gehrlein for Rochester Chapter.**

Tells of Needs of the Gas Turbine at Ottawa

Speaker: M. S. Kuhring

National Research Council

"The Gas Turbine Engine and Some of Its Metallurgical Needs" was the topic of an address by M. S. Kuhring, head, engine laboratory, National Research Council, Ottawa, Canada, at **Ottawa Valley.**

Mr. Kuhring explained the various types of aircraft propulsion methods, what they accomplish, and their limitations as to type of service required. Some of the general problems always considered regarding engine design are weight and where possible added weights can be placed.

The various stages in the turbine engine with regard to problems which have been solved and must still be solved were discussed in detail. Some of the difficulties encountered include those involving air flow, fuel injection, combustion gas flow, compressor and turbine blade cooling, deposits formed on blades, afterburner design, icing, fretting corrosion, bearing heating or cooling and lubrication, and reduction gears where turbo-props are used.

Dr. Kuhring stated that engine designers should take advantage of new materials being developed. He also suggested possible development of either coatings or finishes for blading materials to extend the use range of present materials.

A film illustrating the method of construction of the Canadian designed and built A. V. Roe CF-100 and a film depicting the U.S.A.F. test to destruction of a jet engine into which a ¼-in. bolt was introduced were shown. — **Reported by D. A. Scott for Ottawa Valley.**

IMPORTANT MEETINGS

For May

May 2-4—Investment Casting Institute. Spring Meeting and Exhibit, Warwick Hotel, New York. (Harry P. Dolan, Executive Secretary, I.C.I., 27 E. Monroe St., Chicago 3).

May 3-9—American Foundrymen's Society. Castings Congress and Show, Convention Hall, Atlantic City. (William W. Maloney, Secretary, A.F.S., Golf & Wolf Rds., Des Plaines, Ill.)

May 4—American Association of Spectrographers. 7th Annual Conference, Chicago. (John P. Merutka, Conference Chairman, A.A.S., c/o H. M. Harper Co., 8200 Lehigh Ave., Morton Grove, Ill.)

May 6-9—American Institute of Chemical Engineers. Spring Meeting, Roosevelt Hotel, New Orleans, La. (F. J. Van Antwerpen, Secretary, A.I.C.E., 120 E. 41st St., New York 17).

May 7-11—American Welding Society. National Spring Meeting and Welding Show, Hotel Statler and Memorial Auditorium, Buffalo, N. Y. (J. G. Magrath, Secretary, A.W.S., 33 W. 39th St., New York 18).

May 16-18—Society for Experimental Stress Analysis. Spring Meeting, William Penn Hotel, Pittsburgh, Pa. (W. M. Murray, Secretary, S.E.S.A., P. O. Box 168, Cambridge 38, Mass.)

May 20-23—Industrial Heating Equipment Association. Spring Meeting, Homestead, Hot Springs, Va. (Carl L. Ipsen, Executive Vice-President, I.H.E.A., Associations Bldg., Washington, D. C.)

May 23-24—American Iron and Steel Institute. Annual Meeting, Waldorf-Astoria, New York. (George S. Rose, Secretary, A.I.S.I., 350 Fifth Ave., New York 1).

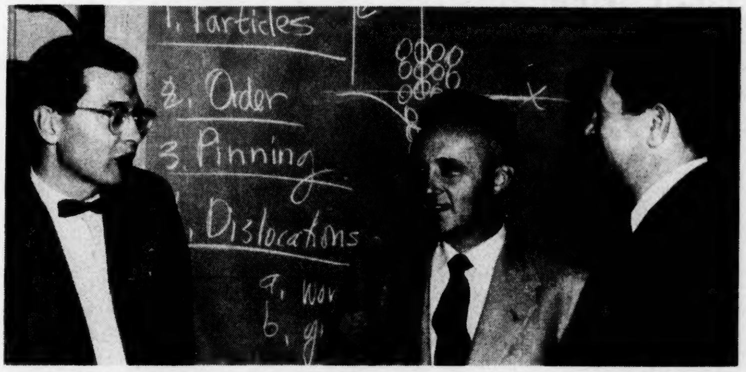
Illustrates Applied Welding Engineering at Carolinas

Speaker: A. N. Kugler
Air Reduction Sales Co.

"Applied Welding Engineering" was the subject discussed by Arthur N. Kugler, chief welding engineer of the Air Reduction Sales Co., at a meeting of the **Carolinas Chapter.** Mr. Kugler supplemented his talk with a slide film on welding engineering which he prepared for the American Welding Society.

The remainder of the meeting consisted of a panel discussion on the "Joining of Metals". A. R. Fairchild acted as moderator of the panel which consisted of R. L. Cope of the industrial engineering department of North Carolina State College, and Mr. Kugler. — **Reported by J. W. Koresh for Carolinas Chapter.**

Describes Dislocation Theory



J. C. Fisher, General Electric Research Laboratory, Addressed the Los Alamos Chapter on "Dislocations and Strength of Alloys". From left are: Dr. Fisher; Robert T. Phelps, chairman; and Robert B. Gibney, technical chairman of the meeting. (Photograph by C. O. Matthews for Los Alamos)

Speaker: John C. Fisher
General Electric Research Laboratory

John C. Fisher, manager of the physical metallurgy section, General Electric Research Laboratory, spoke on "Dislocations and the Strength of Alloys" at a recent meeting of the **Los Alamos Chapter.**

Dr. Fisher credited the development of the dislocation theory to its present useful state to discoveries by such eminent scientists in the field as Frank, Read, Shockley, Orowan, Seitz and others. He expressed his own feeling that the concept of dislocations is most useful in explaining observed mechanical properties of metals and stated that, while many of the explanations of behavior are yet on a qualitative basis, there are increasing indications that quantitative analyses by dislocation theory may be expected to become more and more prevalent.

After briefly describing the form and behavior of edge and screw dislocations, Dr. Fisher referred to the discovery at the Bell Laboratory of cadmium and tin single crystal "whiskers" which displayed phenomenal strength approaching that of the calculated theoretical value of 1 million lb. per sq.in. This discovery has had the effect of stimulating considerable research along these lines in G.E.'s laboratories and probably in many other research laboratories as well. He described four ways in which dislocations in metals can increase mechanical strength. He stressed that these ways are not new in themselves, several being among the standard approaches used by metallurgists for many years to improve the mechanical properties of metals. Rather, the theory of dislocations provides the key idea for understanding how the observed improvements in properties come about.

The first of these and perhaps the oldest approach toward explaining observed behavior by dislocation theory is that of improved mechanical strength through the precipitation of particles of a second phase. Here, dislocations moving through the structure are conceived to become stuck on the precipitated particles and to require increased stress to continue their movement.

The second instance concerns the increase in strength of various alloys due to ordering. In zinc-copper alloys of ordered atomic structure the slip of atomic planes produced by deformation gives rise to zinc-zinc atom pairs which are associated with increased internal energy and are indicative of work in-put into the structure. More pronounced behavior of this kind is found in the copper-gold system in which a significant fraction of strength is attributed to short-range order of the copper and gold atoms.

A third explanation of observed behavior is that called "pinning", discovered by Cottrell. In the common practice of heating a dilute alloy such as iron-carbon, the carbon atoms are conceived to diffuse through the structure of iron atoms toward centers of existing dislocations. On cooling, the positioning of carbon atoms at dislocations makes it more difficult to move the "pinned" dislocations through the structure and this effect is revealed in the increased strength which results from the common process of strain aging.

The fourth effect of dislocations is that of increased strength as a result of work hardening. The plastic deformation of metal by work hardening increases the number of dislocations present in the structure to a number as high as 10^{12} cm. of dislocations per cc. With this high density of dislocations, equivalent to about one dislocation per 100 atoms in every direction, the dislocations clog each other, resulting in increased stress being required to produce a given strain.—**Reported by Daniel J. Murphy for Los Alamos.**

Meet Your Chapter Chairman

M. J. Mianulli

J. E. Gustafson

M. Meyerson

WASHINGTON

MELVIN MEYERSON, metallurgist, National Bureau of Standards, was born in Portsmouth, Va., received his B.S. degree in metallurgical engineering from Virginia Polytechnic Institute, and M.S. degree in metallurgy from the University of Maryland. He started with the Bureau of Standards in 1946, immediately after completing service with the Corps of Engineers, being separated as a major.

Melvin, who is married and has two sons, has been a member of the Washington Chapter executive committee since 1947, served as secretary from 1950 to 1954; and as vice chairman last year. He is presently on the A.S.M. National Education Committee.

Melvin is engaged in research on materials for gage blocks, characteristics of slack quenched steels and metallurgical problems of the Bureau of Engraving and Printing. His hobbies are numismatics and photography and he is active in Army Reserve affairs, currently holding the assignment of director of the engineer branch of the Washington Army Reserve School.

PENN STATE

MICHAEL J. MIANULLI, manager, customer service division, Titan Metal Manufacturing Co., was born in Philadelphia and attended elementary and high school there. He graduated in 1939 from Pennsylvania State University with a B.S. degree in metallurgy. He has been associated with Titan Metal since graduation, first in the metallurgical and sales department before being assigned to his present position.

Mike is married and has three children, Michael, age 9, Alan, age 6, and Marc, age 1. He is active on A.S.T.M.'s Committee B-5 and several subcommittees, and on the Standards Committee of the Copper and Brass Research Association, as well as being past chairman of the David Ford McFarland Award Committee of the Penn State Chapter.

Mike enjoys working with the Cub Scouts, and his hobbies include woodworking, golf and gardening.

SPRINGFIELD

L. BREWSTER HOWARD was born in Worcester, Mass., in 1913. He attended high school in Worcester and Worcester Polytechnic Institute. His first job was with the Factory Insurance Association, and he spent some time doing methods work, and in charge of tooling and cutting tool program for a large machine tool manufacturer and as assistant factory manager in charge of engineering inspection, tooling and production for a press shop. He is presently superintendent at American Saw and Manufacturing Co.

Mr. Howard is married and has four children. He is a member of several Masonic orders and A.S.T.E. and has served his chapter A.S.M. in several capacities before becoming chairman. Swimming, boating, water skiing and a basement work shop take up most of his spare time.

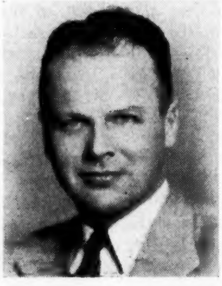
NORTHWESTERN PENNSYLVANIA

EDWARD E. HALL was born in Osceola Mills, Pa., and graduated from Pennsylvania State University in 1934 with a B.S. degree in metallurgy. He has been with Universal-Cyclops Steel Corp. since 1935, first at Bridgeville, Pa., as a metallurgist in the laboratory and as supervisor in the mill laboratory until 1945. He became chief metallurgist of the Titusville, Pa., plant in 1945, and since February 1955 has been technical director of toolsteels.

Ed has two daughters, age 17 and 14. He likes reading and hiking, and serves on the toolsteel committees of A.I.S.I. and A.S.T.E.

C. E. Swartz

L. B. Howard



Edward E. Hall

OREGON

JAMES E. GUSTAFSON was born and educated through high school in Orofino, Idaho, and graduated from the University of Washington with a B.S. degree in mechanical engineering. He participated in track, specializing in pole vaulting.

In 1937 he started the training course for college graduates with Bethlehem Steel Co. He became a sales representative for Bethlehem in 1939.

Jim was active in the local chapter A.S.M. as secretary-treasurer and vice-chairman before becoming chairman. He and his wife, Alice, have three children, and he belongs to a golf club (7 handicap), hunts deer with no luck, and is a member of the B.P.O.E.

Jim entered military service as an R.O.T.C. graduate and was discharged in 1946 as a lieutenant colonel in the Infantry, having received the Bronze Star, five battle stars and the Combat Infantry Badge as well as the Purple Heart.

CHICAGO-WESTERN

CARL E. SWARTZ, consultant in metallurgy and materials, was born in Olney, Ill. He received a B.S. degree from University of Illinois, M.S. and Ph.D. from the University of Wisconsin, and did special work at Rutgers, University of California and the Harvard Graduate School of Business Administration.

Carl worked as a research metallurgist with American Smelting and Refining Co., chief metallurgist, Cleveland Graphite Bronze Co., division metallurgist, Kellex Corp., and chairman of metals research, Armour Research Foundation.

A member of A.S.T.M., A.I.M.E. and S.N.T., Carl was chairman of the Cleveland Chapter A.S.M. in 1941-42, the Cleveland executive committee from 1935-43, National Nominating Committee, 1943, Washington Chapter executive committee, 1947-48, and Chicago Chapter executive committee, 1954-56.

Farming, photography and figure skating are Carl's hobbies.

Jacksonville Members Guests of Tank Plant

Over 80 Members and Guests of the Jacksonville Chapter Visited the Buffalo Tank Co. During a Recent Meeting. N. H. Dye, southeastern district manager, Lincoln Electric Co., presented a talk on "Iron Powder Welding Electrodes". A tour of the plant followed the talk. (Reported by Chet Shira for Jacksonville Chapter)

Ft. Wayne Hears Details Of Titanium and Its Uses

Speaker: G. W. Bauer

Mallory-Sharon Titanium Corp.

G. William Bauer, supervisor of metallurgical research at Mallory-Sharon Titanium Corp., spoke on "Titanium" at a recent meeting held by **Fort Wayne Chapter.**

Mr. Bauer stated that, although titanium has just recently come of age, it was first isolated by Gregor in 1797. Since then, various methods of processing this element have been developed. In 1937, Kroll developed the method of producing titanium sponge which is the method used today; in 1948, DuPont started commercial production with this method. In 1950, 500 tons of titanium sponge were produced; 5000 tons were produced in 1954; and 9000 tons were produced in 1955.

Titanium is the fourth most abundant metal on earth and the ninth most abundant element. Titanium is only 56% as heavy as steel, yet, with the addition of certain alloys, it can be treated to have a strength over 200,000 psi.

Mr. Bauer mentioned that titanium is extremely brittle unless it is over 99% pure. It is nonmagnetic and has low thermal and electrical conductivity. Furthermore, it is highly resistant to acids and salts, although alloys of titanium have better corrosion resistance than the unalloyed metal. At 100° F., aluminum has a better strength to weight ratio, but at 600° F., aluminum has no strength to weight ratio, whereas titanium has no competition.

Titanium is being used in jet aircraft engines because of its light weight and good high-temperature properties, and in applications requiring good corrosion resistance and also for military ordnance, such as light-weight airborne equipment.

The cost of titanium has been fairly high because it must be melted in a vacuum, is difficult to roll and is tough to machine. However, new methods of processing this "wonder metal" are being developed and as they are developed the price will drop, thus making titanium definitely a metal with a future.—**Reported by J. P. Crosbie for Fort Wayne.**

Manufacture of Tubing Described at Peoria

Speaker: John J. B. Rutherford

Babcock & Wilcox Co.

John J. B. Rutherford, chief metallurgist, Babcock and Wilcox Co., spoke on the "Manufacture of Tubing" at a meeting of **Peoria Chapter.**

About 10% of the 120 million tons of steel produced in the United States every year is manufactured into tubular goods, mainly, gas transmission lines, water pipe, oil country goods and standard pipe. About 10% of the quantity is represented as specialty tubing, engineered to specifications for boiler, oil still, chemical, bearing, automotive, aircraft and atomic energy applications.

A series of slides, presented with the talk, outlined the steps of specialty tubing manufactured at Babcock & Wilcox. The steel mill is equipped with four electric furnaces and a 1000 and a 5000-lb. induction furnace to make semicommercial quantities during development. Tubing manufacturing facilities include five rotary piercing mills, with auxiliary equipment for plug, bar and stretch rolling. Cold finishing to obtain a finer surface, closer dimensional tolerance and improved mechanical properties or machinability, is performed by draw benches or roto-rocking equipment in a variety of sizes. Mr. Rutherford explained various equipment used for heat treating (a large variety of carbon, alloy and stainless steel), for upsetting, polishing, pickling and straightening. Welded tubing is manufactured from strip by the electric resistance method for carbon steel, and by the automatic, inert-arc (without filler metal) method for stainless steel. The end product is subject to close examination, involving chemical analysis, mechanical tests, dimensional and visual checks, and recently, electrical, magnetic and ultrasonic tests for quality.

All AISI steels have been manufactured into tubing, either the welded or seamless form, and size ranges from ½ to 9½ in. o.d. While the vast majority of tubing is used in round form, numerous shapes are available.

Mr. Rutherford concluded the evening with an interesting discussion of tubing problems encountered by tubing customers.—**Reported by J. M. Warfield for Peoria.**

has not increased its dues ($10.00 per year) since it was founded.

Metallurgical News and Developments

Devoted to News in the Metals Field of Special Interest to Students and Others

A Department of *Metals Review*, published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Form Company—The formation of Schwarzkopf Development Corp. has been announced by Paul Schwarzkopf, president and owner of the powder metallurgical concern. Schwarzkopf succeeds the American Electro Metal Corp. and its activities will cover all fields of powder metallurgy. The company is also the sole owner of Europe's largest powder metallurgy plant, Metallwerk Plansee in Tyrol, Austria.

To Build—Metal & Thermit Corp. will begin construction on an 800-acre tract near Montpelier, Va., of a plant for mining and processing of titanium-bearing ore. The new plant will produce rutile and ilmenite.

Research Application—Office of Ordnance Research has initiated an application form for use in submitting proposals for research funds. Interested individuals who wish to undertake projects in Ordnance basic research may obtain applications by writing to: Office of Ordnance Research, U. S. Army, Box CM, Duke Station, Durham, N. C., and requesting Form CS-51.

Scouts—Roy E. Marquardt, president of Marquardt Aircraft Co., has inaugurated an experimental unit of "Science Scouts", which will perhaps become an official part of the Boy Scouts of America. The idea of the Science Scouts is to fill the need of interesting high-school boys in engineering careers, and developing technical programs to foster this interest. Further information may be obtained by writing to Robert Hill of the San Fernando Valley Council of the Boy Scouts of America.

Magnetic Conference—A Conference on Magnetism and Magnetic Materials will be held in Boston Oct. 16 to Oct. 18, 1956, by the American Institute of Electrical Engineers in cooperation with the American Physical Society, the American Institute of Mining and Metallurgical Engineers, and the Institute of Radio Engineers. Authors should submit titles of proposed papers by June 15 and abstracts by Aug. 1. Details from: T. O. Paine, Measurements Laboratory, General Electric Co., West Lynn, Mass.

Copper—Capacity of the free world's copper mines will reach 3,386,000 short tons by 1958, according to Copper and Brass Research Association. Additional capacity, a 15.7% increase over 1955 capacity, is based on recent study by the Association.

Paris Congress—The 6th International Mechanical Engineering Congress will be held from June 4 through June 9, 1956, in Paris, France. Theme this year will be "Surface Treatment for the Improvement of Mechanical Properties and Protection Against Corrosion".

Form Association—Formation of the Ultrasonic Manufacturers' Association to promote dissemination of sound and accurate information about ultrasonic equipment and its applications has been announced.

European Office—The General Electric Research Laboratory's new European office has been located in Zurich, Switzerland. It is hoped the new office will strengthen scientific contacts between GE's lab and basic research activities being conducted in Europe.

Summer Program—"Wear Theory in Metal Cutting and Bearing Design" is the subject of a two-week special summer program to be offered by the Metals Processing Division of the mechanical engineering department, M.I.T., from June 18 through June 29, 1956. The program is designed for research workers, teachers, development engineers and others concerned with the problem of preventing wear betwen surfaces that operate in sliding and cutting contact.

Awards Contracts—The Union of Burma has awarded two contracts to Armour Research Foundation for greater development of its Applied Research Institute and for metallurgical and mineralogical research.

AIME To Meet—The annual A.I.M.E. Pacific Northwest Regional Metals and Minerals Conference will be held at the Olympic Hotel in Seattle from May 3 through May 5. From a one-day program dealing with industrial minerals only, the sessions have expanded until now geology, industrial minerals, minerals beneficiation, iron and steel, mining, extractive and physical metallurgy and mineral industries education are included in a three-day program.

Spectrography Course—Boston College has announced a special two weeks intensive course in "Modern Industrial Spectrography" from July 16 to July 27. The course is designed for chemists and physicists from industry who want to learn the techniques of emission spectroscopy as an analytical tool. Write for information to: Prof. James J. Devlin, S. J., Physical Dept., Boston College, Chestnut Hill 67, Mass.

New Die Steel — Vanadium-Alloys Steel Co. has announced the development of a new medium-carbon-alloy die steel called MC-Mold and Cavity Steel. It is designed to provide a die steel for molds and cavities where high surface finish is desired, can be uniformly deep hardened at hardness ranges from Brinell 300 to 350 throughout sections as large as 20 by 10 in.

Solar Energy—University of California Extension this spring will open the first integrated university-sponsored course on the "Utilization of Solar Energy." The course will cover a series of 12 lectures, to be given each Friday, starting Apr. 6, at 7:00 p.m. in the U.C.L.A. chemistry building.

Announce Opening — The Saugus Ironworks Restoration, 300-year old "birthplace" of America's iron and steel industry, will open for the 1956 tourist season on Apr. 17. The ironworks is located just east of U. S. Route 1, 10 miles north of Boston. Last year, 17,500 persons visited this shrine to one of America's great industries.

Metals Institute—The Second Annual Metals Institute will be held on the A & M Campus, Stillwater, Okla., on May 7 and 8, 1956. The Meeting will feature nationally known specialists in the field of metallurgy who will be speaking on the technical phases of this subject. For details, write: B. M. Aldrich, Coordinator, School of Mechanical Engineering, Oklahoma A & M College, Stillwater, Okla.

Shell Molding Research — Shallway Corp., Connellsville, Pa., has announced the establishment of the Shalco Research Center, to act as a clearing house for the exchange of technical information relating to shell molding pattern and core box design.

Carnegie Lecturer at Pittsburgh

Past National President George A. Roberts Is Shown, Left, Presenting a Certificate Commemorating the Eighth Annual Carnegie Lecture of the Pittsburgh Chapter to Robert F. Mehl, Dean of Graduate Students and Head of the Department of Metallurgical Engineering, Carnegie Institute of Technology. Dr. Mehl gave a talk on "Formation of Ferrite, Cementite and Bainite From Austenite". Dr. Roberts was once a student of Dr. Mehl

Speaker: Robert F. Mehl

Carnegie Institute of Technology

The Eighth Annual Carnegie Lecture of the **Pittsburgh Chapter** was delivered by R. F. Mehl, dean of graduate students and head of the department of metallurgical engineering, Carnegie Institute of Technology. Dr. Mehl's former student, A.S.M. past president George A. Roberts, introduced the speaker and his subject, "The Formation of Ferrite, Cementite and Bainite From Austenite".

In discussing the history of the subject, Dr. Mehl covered the development of the TTT diagram and the subsequent understanding of the formation of pearlite. Although the TTT diagram predicts the product that will form on quenching low carbon steels, it fails to tell the nature of the product, which may be of equal importance in determining the properties of the steel. Until recent years, the morphology of ferrite and the nature of bainite had not been thoroughly investigated. Continuing research at Carnegie Tech has uncovered many facts concerning these mysteries. Although these facts do not present an absolute picture, they do eliminate many of the postulated explanations. The talk drew heavily on the work of Dr. Mehl's colleagues at Carnegie Tech.

Dr. Mehl discussed the mechanisms controlling the morphology of ferrite and showed some very excellent photomicrographs of the types of ferrite that form. He presented slides showing the effect of grain size, temperature and percent carbon on the type of ferrite formed. Using these graphs in conjunction with the TTT diagram should allow one to predict not only the product but also the nature of the product formed when carbon steels are quenched.

In the discussion of bainite, Dr. Mehl showed a very clear electron photomicrograph of carbide particles between layers of ferrite in bainite. Further evidence presented led to the conclusion that bainite is merely low-temperature ferrite with carbides distributed throughout. The bainite is formed by carbide precipitation from previously nucleated supersaturated ferrite at ferrite-ferrite boundaries; the carbide distribution is dependent on the supersaturation and the carbon gradient in front of the advancing ferrite. At high temperatures this results in precipitation almost entirely at ferrite-ferrite boundaries. At lower temperatures other sites may become active.—**Reported by L. M. Bianchi for Pittsburgh.**

New Films

Tools of Abundance

This 28-min. color sound film deals in story form with the basic functions of America's "production team"—design, process and tool engineers, tool grinders, machine operators, purchasing, etc. The film takes a single vital part of a single new product and shows how each member of the team contributed to solving the problems connected with its production. Prints are available from Wesson Co., 1220 Woodward Heights Blvd., Ferndale 20, Mich.

Zinc Controls Corrosion

A 16-mm. sound and color motion picture, produced by the American Zinc Institute, illustrates how zinc controls corrosion so as to lengthen life and to minimize maintenance and replacement costs. The film, which runs about 35 min., also demonstrates the general mechanism of corrosion as well as how zinc controls it. It explains methods for coating steel stock or products with zinc, and surveys the various fields of usefulness for zinc-coated parts. Write to: American Zinc Institute, Inc., 60 East 42nd St., New York 17, N. Y.

Exhibits Stamping at Western Ontario

Stanley Cope, Acme School of Die Design, Presented a Talk Entitled "The Technical Consultant's Place in the Metal Stamping Industry" at a Meeting Held by the Western Ontario Chapter. Mr. Cope described and illustrated a variety of deep drawing and other problems, explaining their cause and solution. Shown are, from left: J. L. Kemp, Acme School of Die Design; Mr. Cope; H. V. MacKinnon, Imperial Oxygen Ltd.; and F. P. McQuire, Ford Motor Co. of Canada, Ltd., (Reported by R. V. Hutchinson)

Leaded Steels Topic at York Meeting

W. T. Rubin (Left), Field Metallurgist, Copperweld Steel Co., Spoke on "Leaded Steels" at a Meeting Held by York Chapters A.S.M. and A.S.T.E. At right is W. W. Sellers, program chairman of the York Chapter A.S.M.

Speaker: W. T. Rubin
Copperweld Steel Co.

Willard T. Rubin, field metallurgist for Copperweld Steel Co., presented a talk entitled "Leaded Steels" at a joint meeting of the **York Chapters** A.S.M. and A.S.T.E.

Mr. Rubin pointed out that in present-day economy, it is imperative that manufacturing costs be minimized. Interest in leaded steels is increasing mainly because they provide better machinability, resulting in increased production, longer tool life, better chip formation, finer finishes, and lower cost per unit part. In addition to the above, improved machinability of leaded steels can result in the elimination of some machining operations such as combining the roughing and finishing cuts into one operation, and, because of finer finishes, it can minimize the number of grinding passes necessary to finish a part.

Mr. Rubin traced a 25-year history of leaded steels. When pure lead shot, 20 to 60 mesh, is properly directed into the stream of molten steel emerging from the ladle during teeming into ingot molds, proper recovery of the lead in steel is effected, homogeneously distributed in submicroscopic particles throughout the ingot in volumes between 0.15 and 0.35%.

Rolling practice, conditioning, annealing, heat treating and cold finishing operations are identical with those for nonleaded grades. Top discard for hot-top leaded ingots is equivalent to that of nonleaded grades, but bottom discard is increased by 2% to eliminate any segregation from lead globules which might accumulate near the bottom.

Quality control is the same in testing leaded steel with one exception—the "sweat" or "exudation" test. Full cross section billet samples 2 in. thick are cold sawed, oil coated, then heated to 1290° F. for 1 hr. in a furnace, cooled to room temperature and examined for lead segregates. Rating for acceptance or rejection is made by comparing to a standards chart. Lead content can be determined by wet or spectrographic methods, and by means of an X-ray spectrograph, the amount of lead radiation, proportional to the lead present, is detected and recorded by a geiger counter.

All available data, Mr. Rubin said, indicate that no appreciable differences in tensile strength, ductility or impact strength result from the addition of lead to steel, properly done. Hardenability, and the character or type of carburized case are also unaffected. Manufacturers' tests show that fatigue life is not affected.

With certain modifications, leaded steels can be brazed or welded without deviation from standard practice. Mr. Rubin used slides to illustrate his talk. — **Reported by J. L. Brown for York Chapter.**

Reviews High-Temperature Metallurgy at Hartford

Speaker: F. M. Richmond
Universal-Cyclops Steel Corp.

Frank M. Richmond of the research and development department, Universal-Cyclops Steel Corp., addressed the **Hartford Chapter** on "Recent Developments in High-Temperature Metallurgy". His remarks were primarily restricted to the strength properties of high-temperature alloys and did not take into account side effects such as oxidation resistance or fabrication problems.

Numerous slides which compared the characteristics of various alloys were used to illustrate the talk. Of particular interest were the comparative figures for physical properties of vacuum versus conventional melted alloys of the same analysis.

Mr. Richmond concluded his talk with some remarks on the problems that still remain in the field of high-temperature alloys.—**Reported by Gordon W. Hunt for Hartford.**

Northern Ontario Entertains Ladies

C. C. Benton, Chairman (Right) and D. Joyce, Vice-Chairman (Left) of Northern Ontario Chapter, Look at Welcoming Poster With Their Wives During the 6th Annual Ladies Night Meeting. (Reported by J. L. Venier)

Outlines Developments in Powder Metallurgy at Columbus Chapter Meeting

Speaker: R. P. Koehring

Moraine Products Division
General Motors Corp.

R. P. Koehring, section engineer, Moraine Products Division, General Motors Corp., presented a talk entitled "Recent Developments in Powder Metallurgy" at a meeting held by **Columbus Chapter.**

Mr. Koehring stated that the reason for the rapid growth of sintered products is because this fabrication method has definite economic advantages in comparison with other more well-known methods. A distinct advantage of the use of this process is that parts of close finish dimensions can be readily produced.

Recent larger scale operations within the industry have helped to reduce costs. For instance, powder mixes in lot sizes up to two tons each have reduced powder preparation costs. Improved tooling techniques are now being used in briquetting, and Mr. Koehring illustrated this with a series of slides showing die design features. The effects of particle size, side-wall friction and geometry in relationship to final density were discussed. It was pointed out that the final coining after sintering enables very close dimensional results.

Heat treatment of the sintered product yields fairly satisfactory results. Although the lack of density prevents successful carburizing, steam treating is being used to produce oxide films on particles. This treatment results in a substantial increase in surface wear resistance. The lack of density is used to advantage on bushings and bearings which allow for the surface retention of lubricants. Strength on ferrous sintered products is being doubled by impregnation with copper. The benefits are twofold: A denser structure results by filling of the voids with copper; and some of the copper is diffused into the ferrite, which results in the solution-strengthening of the ferrite.

Mr. Koehring illustrated his lecture with a collection of samples which he had brought with him. Among the samples were a series of copper-bearing heat treated gears. These gears are being successfully used to make up a gear train on an automatic washing machine.

Present laboratory work has produced specimens that have tensile strengths approaching 80,000 psi. as sintered, and 150,000 psi. after heat treatment. The realization of these strength values in the laboratory makes their successful application on commercial products an encouraging goal for the future.—**Reported by James J. Kubbs for Columbus.**

Receives Certificate at Syracuse

At a Meeting of the Syracuse Chapter, Fred Hunter, Chairman (Right), Presented James M. Hutton, Past-Chairman of the Chapter, With a 25-Year Membership Certificate. D. B. Martin, Amplex Division, Chrysler Corp., presented a talk entitled "Powder Metallurgy" during the meeting

Speaker: D. B. Martin

Chrysler Corp.

The most recent meeting of the **Syracuse Chapter** again showed increased member interest as an above-average number of persons were present for dinner and for the technical session. In a ceremony preceding the technical lecture, Fred Hunter, Chapter chairman, presented James M. Hutton a 25-year membership certificate. Mr. Hutton served as Syracuse's chairman in 1934 and helped direct the growth of the Chapter through the difficult years in the early 1930's.

D. B. Martin, vice-president of the Amplex Division of Chrysler Corp., presented a talk on "Powder Metallurgy."

Mr. Martin outlined the production and the use of powdered metal parts in American industry. He illustrated the increasing use of this method of fabrication from 1928, when the clutch pilot bearing was made by sintering metal, to the present time, when over 100 uses for powdered metal parts can be found in automobile construction.

Some of these uses are in bearing materials, in finished machine parts and in gas and liquid filtering. Often the substitution of sintered material for wrought or cast materials proves economical. We supply customers, Mr. Martin said, with finished machine parts without the necessity of machining. In addition to the saving in machining time and expense, the problems of excess stock and scrap are also eliminated.

Mr. Martin pointed out that the use of sintered metal parts is worthy of serious consideration in numerous applications throughout industry.—**Reported by Lou Zakraysek for Syracuse Chapter.**

OBITUARIES

COLIN S. KIDD, vice president and plant superintendent of the Standard Steel Treating Co., died suddenly late in January. Mr. Kidd, who was 39, was born in Scotland and came to Detroit at an early age. He graduated from Lawrence Institute of Technology in 1940 and had been employed at Standard since 1936. He became plant metallurgist in 1944, superintendent in 1944 and was elected vice-president and plant superintendent in 1951. Mr. Kidd has been a member of A.S.M. for a number of years.

♦ ♦ ♦

FERDINAND J. POHLMEYER, chief metallurgist, National Broach & Machine Co., passed away at his home in Detroit in February. He began his career with the original National Broach & Machine Co. in Dayton and came with that organization to Detroit when the present company was formed in 1929. Mr. Pohlmeyer, an expert in the heat treatment and manufacture of high speed steel tools, was a member of the Detroit Chapter.

♦ ♦ ♦

JOHN M. SYLVESTER, general manager, Bethlehem Steel Co., died after an illness of several months late in February. Mr. Sylvester, a native of Washington, D. C., and an alumnus of the U. S. Naval Academy, Class of 1911, started with Bethlehem in 1914. He was appointed assistant manager in 1936 and manager in 1945. He was a member of the Lehigh Valley Chapter.

♦ ♦ ♦

HERBERT B. PETTO, 56, a foreman at Pratt and Whitney, Inc., died suddenly late last year. With Pratt and Whitney for the past 25 years, Mr. Petto was an honorary member of the Hartford Chapter.

Tri-City Hears Talk on Nodular Iron

T. E. Eagan (Center), Chief Research Metallurgist, Cooper-Bessemer Corp., Is Shown at a Meeting of Tri-City Chapter With Phillip E. Goettsch, the Chairman (Left), and W. K. Hunt, Technical Chairman of the Meeting

Speaker: T. E. Eagan
Cooper-Bessemer Corp.

"Practical Aspects of the Properties of Nodular Iron" was the subject of a talk presented at a meeting of the **Tri-City Chapter** by T. E. Eagan, chief research metallurgist of the Cooper-Bessemer Corp.

Mr. Eagan has been closely associated with the development of nodular, or "ductile" cast iron ever since the introduction of the process in 1948, the first commercial heat of the new material having been poured in the Cooper-Bessemer Corp. foundry in 1949. Since that date its use has increased steadily. Applications range from relatively thin-walled piston castings to massive hydraulic fittings, pump heads and cylinders, and diesel engine blocks weighing several thousand pounds.

The outstanding strength and ductility of this material, as compared with gray iron of the same composition, are readily accounted for by its microstructure. Treatment of the molten iron with very small amounts of magnesium results in a marked modification in the form and distribution of the graphite upon solidification. Instead of the familiar flake structure of gray iron, the graphite is present in the form of small nodules or spheroids in a matrix of pearlite or ferrite which responds to heat treatment in a manner similar to steel. A wide range of mechanical properties can be obtained by quenching and tempering.

Mr. Eagan summarized the foundry practice for nodular iron by stating that in the molten condition its behavior resembles gray iron, but its shrinkage on solidification is much greater. For this reason, a gating and risering practice very similar to that used for steel castings has to be adopted. Different foundries making nodular iron differ in the method of treating and in the magnesium alloy used for the addition. The most common inoculants are a nickel-magnesium alloy and a ferrosilicon magnesium alloy. A pig iron is selected which is low in phosphorus, sulphur and manganese. The final retained magnesium content must be controlled within narrow limits. A number of elements, such as tin, copper and titanium have been found to interfere with nodule formation, but it is now common practice to nullify their effects by the addition of small amounts of cerium in the form of mischmetal or mixed rare earth oxides.

Some of the attractive properties of nodular iron are its high-temperature stability, good notch fatigue resistance, excellent wear resistance and machinability. The material can be cut at a rate six times as fast as steel castings. Some progress is being made in developing welding methods and if the proper conditions can be met good welds can now be produced.

A number of tests were described in which specially designed pressure vessels were used, comparing nodular iron with high-strength gray iron and with cast steel. The superiority of nodular to gray iron for this type of application was clearly demonstrated and in most instances it approached the cast steel in its performance.—**Reported by R. H. Sholtz for Tri-City.**

Detroit Holds Metallurgy Clinic Educational Series

Borrowing a little something from TV, the **Detroit Chapter** successfully conducted a panel quiz program for this year's educational program. The program consisted of a series of question and answer meetings of the "Metallurgy Clinic". The sessions, which were held in the small auditorium of the Horace Rackham Memorial Building, were well attended by the membership.

The Clinic, consisting of seven outstanding metallurgists from the Detroit Chapter, did an excellent job in answering questions on ferrous and nonferrous heat treatment, hot and cold working, electroplating, forging, carbon, tool and alloy steels, process control problems, field service failures, and other subjects. Panel members included D. M. Bigge and R. B. Boswell, Chrysler Corp., H. N. Landis, LaSalle Steel Co., E. Slaughter, Republic Steel Corp., M. Soviak, Commercial Steel Treating Corp., H. G. Tarracks, General Motors Corp., and L. A. Tyner, Ford Motor Co.

J. Gurski, Ford Motor Co., chairman of the educational committee, was quizmaster for each of the three sessions.

All registrants received a mimeographed copy of the questions and answers covered and a copy of the National Bureau of Standards' pamphlet "Mechanical Failures of Metals in Service". — **Reported by L. V. Marchetti for Detroit Chapter.**

Describes Methods of Nondestructive Testing

Speaker: Robert G. Strother
Magnaflux Corp.

Robert G. Strother, eastern regional manager, Magnaflux Corp., covered "Nondestructive Testing in Industry Today" at a meeting held by the **Jacksonville Chapter.**

Prior to his talk, Mr. Strother presented the new Douglas Aircraft Corp. film, "Quality Control Through Nondestructive Testing". The film showed Douglas' use of magnetic particle inspection, fluorescent penetrant inspection, dye penetrant inspection, and pulse and resonant-type ultrasonic testing in airframe manufacture and overhaul. The use of portable magnetic particle and X-ray units for the inspection of critical parts on the aircraft were of especial interest in this film.

In addition to the methods covered in the film, Mr. Strother explained the use of brittle lacquer coatings for stress analysis, the use of electrified particle inspection for detecting invisible cracks in glass and other ceramic materials, the new crack depth indicator, and the new line of eddy-current instruments now being developed for the metalworking industry by Magnaflux.

Mr. Strother's talk was followed by a tour of the Bill Graham Co. facilities where cracked and worn diesel and gasoline engine blocks and heads are completely rebuilt utilizing the latest techniques and equipment.

Magnaflux's conductivity meter, which is used for sorting parts or materials that vary in either alloy content or hardness from an acceptable standard was demonstrated, as well as the crack depth indicator, which measures depth of cracks or seams in magnetic parts.—**Reported by J. F. Campbell for Jacksonville.**

Newest Developments in Plastic Forming of Metals Given at Buffalo

Speaker: Leon Mollick
Loewy Construction Co.

New developments in extrusion presses are breaking down former limitations of this process and designers find an increasing variety of extruded products available. The **Buffalo Chapter** was brought up to date on these developments at a recent meeting by Leon Mollick, chief stress analyst, Loewy Construction Co., who presented a talk entitled "New Developments in the Plastic Forming of Metals".

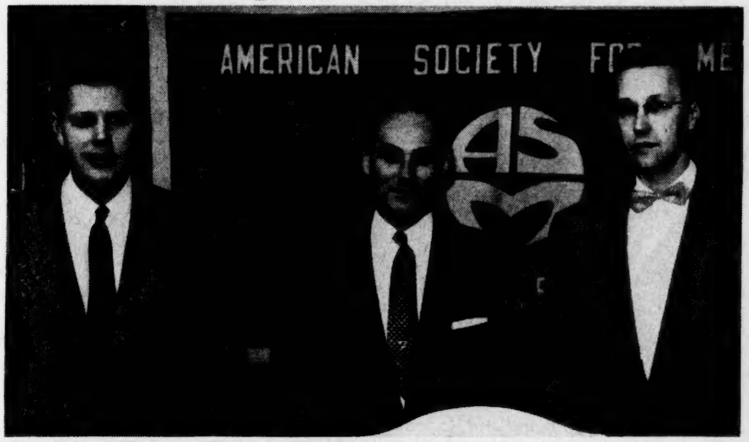
One of the most significant steps in the field of extrusions is that low alloy steel, stainless steel, titanium alloys, and certain of the superalloys can now be produced in extruded form. Die and lubricant requirements are very high but these extrusions can frequently compete with parts machined from bar stock.

Flexibility is the keynote of new press designs. Features are being incorporated which permit the making of tapered extrusions, step extrusions, and other products which are a departure from the uniform shape which has always been a characteristic of extrusions in the past. Step extrusions are simply the result of an interrupted stroke and the removal of one set of dies. Tapered extrusions are usually made by extruding over a tapered mandrel whose position is changed as the extrusion passes through the dies. Another interesting method combines forging and extrusion. A billet is pierced in the press in the same manner that any hollow shape is extruded, except that an auxiliary die is in place at the end of the billet. The piercing stroke is stopped short and the billet has the desired shape forged into one end. The auxiliary die is then removed and extrusion proceeds. The result is a cup-shaped extrusion. This method has been used to produce shell casings.

Low-frequency induction heating has proved an excellent means of heating nonferrous billets for extrusion. A temperature gradient can be maintained in the longitudinal direction of the billet, giving lower die break-through pressures.

Very thin sections with long slender flanges are being extruded, using flat billets. Mr. Mollick stated that billet shape must approximate that of the finished extrusion for a satisfactory product. Extreme billet edges should be about the same distance from the die cavity in order that all parts of the billet receive the same amount of plastic deformation. Flat parts, then, must necessarily be made from flat billets.—**Reported by A. E. Leach for Buffalo.**

Inland Empire Gives Metals Series



The Inland Empire Chapter Has Recently Completed a Series of Four Educational Lectures on the Subject "An Introduction to Metals". An enrollment of 201 in this nontechnical course indicated the demand for this type of practical metallurgy course in the Spokane Area. G. A. Garske, Travis Pattern and Foundry Co., and Curt Graversen, Precision Casting Co., spoke on "Casting"; V. F. Binkley, Kaiser Aluminum & Chemical Corp., spoke on "Working and Annealing"; M. C. Fetzer, Kaiser Aluminum and Chemical Corp., discussed "Strengthening by Alloying and Heat Treating"; and William R. Smith, General Electric Co. Hanford Works, spoke on the "Joining of Metals". Shown are, from left: Mr. Garske, V. E. Flaherty, technical chairman, and Mr. Graversen. (Report by G. S. Fergin)

New Haven Hears Talk on Automation

D. H. Apgar, I.B.M. Co., Presented a Talk on "Automation" at a Meeting Held by the New Haven Chapter. Shown at the speaker's table are, from left: G. B. Rockwell, regional manager, I.B.M. Co.; Al Blank, technical chairman; Mr. Apgar; and Maur Weldon, chairman of New Haven Chapter

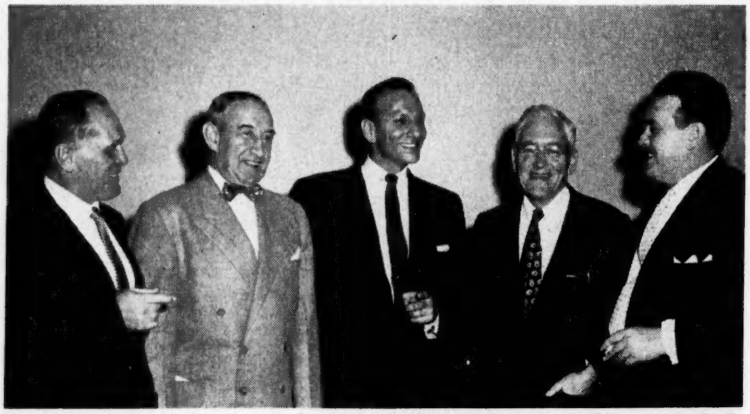
Speaker: D. H. Apgar
I.B.M. Co.

D. H. Apgar, project engineer, manufacturing research department, International Business Machines Co., presented a talk on "Automation" at a meeting held in **New Haven.**

Mr. Apgar compared the digital system concepts for computers with those required to control factory operations. He mentioned that the technical basis for the electronic control of factory automation has its foundation in the fields of computers, instrumentation, and machine tool and process equipment.

A digital control cam miller developed at I.B.M. was described to illustrate factory automation by digital control. A brief review of other existing digital control machining techniques was also given.—**Reported by K. L. Tingley for New Haven.**

Speak on Welding of Stainless Steels



From Left: J. A. Goodford, Speaker, J. Savits, Technical Chairman, J. L. Morosini, Chairman, John Chipman, Past National President A.S.M., and K. A. Matticks, Speaker, Are Shown During a Meeting Held by Boston Chapter. Messrs. Goodford and Matticks, Crucible Steel Co. of America, presented a talk which was entitled "Stainless Steels and Their Welding"

Speakers: J. A. Goodford
Kenneth A. Matticks
Crucible Steel Co. of America

J. A. Goodford, chief welding engineer, and Kenneth A. Matticks, stainless contact metallurgist, Crucible Steel Co. of America, recently addressed the **Boston Chapter** on "Stainless Steels and Their Welding".

Mr. Matticks defined stainless steel as being a steel containing a minimum of 11.5% chromium and which may contain other alloying elements. Stainless was developed independently just prior to World War I by England, Germany and the United States. The first commercial use of stainless steel began in 1924.

Today there are over 50 grades of stainless available. They can be broken down into the following basic types: martensitic (AISI 400 series), ferritic (3 grades in the AISI 400 series); and austenitic (AISI 300 series).

Approximately 85% of the stainless steels produced are the austenitic type. Nickel is added to improve the ductility and physical properties as well as slightly improving the corrosion resistance.

The corrosion resistance in stainless steels is attributed to the thin film of chromium oxide which forms on the surface. If this film is mechanically disturbed, it will renew itself in the presence of oxygen.

Nitriding stainless steels is not recommended, since it destroys or reduces the corrosion resistance. Despite the fact that nitriding is not encouraged in stainless grades, much of it is commercially nitrided in production.

Mr. Matticks discussed problems occurring in the austenitic steels when they are sensitized by being raised to a temperature of 1000 to 1400° F. and held for sufficient time to result in carbon migrating to the grain boundary. The carbon picks up chromium in the process to form chromium carbide in the grain boundary, leaving the grain nonstainless. Intergranular attack occurs in the presence of certain chemicals. Fast cooling from the annealing temperature is recommended to prevent steels from becoming sensitized.

Passivation is the process by which free iron deposited on the surface of the steel in fabrication is removed to prevent oxidation of iron resulting in pitting of the surface. Nitric acid is most frequently used for this operation, although other chemical and even mechanical means may be used. Passivation must be the last operation in the fabrication of stainless grades.

Mr. Matticks discussed briefly the critical shortage of nickel occurring because of increased usage of nickel-bearing alloys. Manganese, which possesses many of the properties of nickel, is now being used to produce equivalent grades of austenitic steels.

Mr. Goodford discussed many of the problems involved in the welding of stainless. He suggested that careful selection of welding rods be made when welding stainless.

When welding 410 H.H. (high hardenability), the welder should both preheat and postheat the part. When welding 410 L.H. (low hardenability), no preheating or postheating is required.

Leaded stainless steels often result in porous welds. Weld rod drawn with lead as a lubricant causes similar problems. Sulphurized grades can be welded, with difficulty. Austenitic steels are not difficult to weld, requiring no preheat or postheat.

Because of the higher coefficient of expansion and low thermal conductivity of these grades, it is desirable to use close tack welding procedures.

The use of acetylene is not recommended because of the slow heating rate which often results in carbide precipitation.

Mr. Goodford used slides to illustrate proper and improper welding procedures.—**Reported by William H. McCarty for Boston.**

Tour University of Florida Labs

Shown Is a Group of Jacksonville Chapter Members Who Joined the Local Section A.S.M.E. in a Tour of the Mechanical Engineering Laboratories at the University of Florida During a Recent Meeting. The program included a report on the recent world symposium on "Solar Energy" by John C. Reed and Erich A. Farber, professors, department of mechanical engineering at the University of Florida. (Photograph Courtesy of Fleming)

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	May 16		E. O. Dixon	Forgings: Their Place in Design and Manufacture
Boston	May 4	M.I.T. Faculty Club	J. W. Gulliksen	Stamping and Deep Drawing Dies for Brass and Copper
Calumet	May 8	Phil Smidt's	A. G. Sturrock	Factors Affecting Machinability of Steels
Carolinas	May 17	Salisbury	L. W. Williams	Manufacture and Fabrication of Clad Metals
Chicago	May 4	Furniture Mart	Social	Ladies Night
Cincinnati	May 10	Terrace Park Country Club		Annual Meeting
Cleveland	May 7	Hotel Hollenden	P. G. Nelson	Progress and Problems in Stainless Steels
Columbia Basin	May			Dance — Annual Meeting
Columbus	May 2		L. E. Gibbs	Working and Joining of Copper-Base Alloys
Dayton	May 24		Social	Golf and Party
Eastern New York	May 8	U.S.O. Hall		Annual Meeting
Ft. Wayne	May 26		Social	Golf Outing
Hartford	May 15	Indian Hill Country Club	A. O. Schaefer	National Officers Night
Indianapolis	May 21	Village Inn	A. E. Focke	Materials Problems in Nuclear Engineering
Jacksonville	May 4	N.A.S. Officers Club	A. O. Schaefer	Application of Emergency Metallurgy to Peacetime Work
Los Angeles	May 24	Rodger Young Auditorium	A. V. Levy	High-Temperature Alloys in Jet Engine Construction
Mahoning Valley	May 8	Westinghouse Electric Corp.		Plant Visit
Milwaukee	May 11		Social	Annual Party
Muncie	May 15		Social	Ladies Night
New Jersey	May 21	Essex House		Wyzalek Night
New York	May 14	Hotel Victoria	John Frye	Atomic Energy
Northeast Pennsylvania	May 10	Irem Temple Country Club		National Officers Night
Northwestern Pennsylvania	May 15	Erie	Social	Ladies Night
Notre Dame	May 9		N. W. Schubring	ABC's of Ultrasonic Inspection
Oak Ridge	May 16	University of Tennessee	Social	Ladies Night
Ontario	May 4	Royal York Hotel	Panel	Stump the Experts
Oregon	May 24	Congress Hotel		Student Affairs Night
Ottawa Valley	May 8	Murphy Gambel's	Social	Ladies Night
Philadelphia	May 10		R. D. Stout	Current Metallurgical Research
Jr. Section	May 10	Engineers Club		Student Night
Phoenix	May 15			Installation of Officers
Pittsburgh	May 10	Gateway Plaza	C. T. Evans, Jr.	Fifth Annual Pittsburgh Night
Purdue	May 16	Memorial Union	L. A. Danse	Dollar Metallurgy
Rochester	May 14	Elk's Club		Annual Meeting
Rockford	May 23	Faust Hotel	R. H. Boettger	Selection and Applications of Toolsteels
Rocky Mountain	May 18	Oxford Hotel		Stainless Steel Applications
St. Louis	May 18	Kingsway Hotel	E. M. Case	Salt Baths
Saginaw Valley	May 19	Rolling Green	Social	Ladies Night
Springfield	May 21	Blake's Restaurant	Panel	Atomic Energy
Tri-City	May 8	Rock Island Arsenal	D. L. Meyers	Army Rocket Program
Tulsa	May 1	Alvin Plaza Hotel	H. P. Rassbach	Stainless Alloy Manufacture and Fabrication Peculiarities
Utah	May	Fort Douglas Officers Club	Social	Spring Festival
Warren	May 10	El Rio Restaurant	A. J. Lena	Freezing—A New Development in Commercial Precipitation Hardening Stainless Steels
Washington	May 14	Naval Gun Factory	W. H. Eisenman	National Officers Night
West Michigan	May 21	Lock's Restaurant	W. Crafts	Recent Trends in Alloy Steel Development
Western Ontario	May 12	London	R. Stewart	Retrospect—35 Years With Metallurgy
Worcester	May 9	Stockholm Restaurant	Social	Ladies Night
York	May 9	Harrisburg	Ben Kaul	Cold Extrusion of Steel

New England Regional Meeting **Bridgeport, Conn.** **May 11**

Aircraft Research Topic at Los Angeles

Harry George (Left), Special Assistant for the Manufacturing Research and Development Department, Republic Aviation Corp., Is Shown With Vice-Chairman J. Dickason, During a Meeting Held by the Los Angeles Chapter

Speaker: Harry George

Republic Aviation Corp.

Pinch-hitting for the regularly scheduled speaker at a meeting of **Los Angeles Chapter,** Harry George, special assistant for the manufacturing research and development department, Republic Aviation Corp., presented a talk entitled "Function of Metallurgical Research in Aircraft Manufacturing".

August Bringewald, project manager for Republic Aviation, who was slated to talk, was delayed in Argentina, and, with just three days notice, Mr. George flew some 3000 miles to Los Angeles to fill the engagement.

Mr. George emphasized the advisability for aircraft companies to do their own metallurgical research on the newer metals, because of the advantages of proximity to fabrication problems, citing examples from the development of the 8% manganese alloy of titanium by way of illustration. He described and discussed several lesser known but important formability factors, including the metal's micronotch sensitivity (and the importance of surface finish), contamination, segregation and microstructure, microcracking, delayed cracking, forming problems at elevated temperature, and cleaning, including pickling.

In the discussion period following the talk, Mr. George proposed a law which he believes holds for structural metals and other elastic solids, analogous to Boyle's law for gases, and suggested an atomic basis for the relationship, and its use as a research tool to study variations such as directionality, and to reveal segregation and density variations, which he has applied to titanium.—**Reported by J. F. Scheffer for Los Angeles.**

Talks at Mahoning Valley On Titanium, Today's Metal

Speaker: F. H. Vandenburgh

Mallory-Sharon Titanium Corp.

At a meeting held by the **Mahoning Valley Chapter,** Frank H. Vandenburgh, vice-president and general manager, Mallory-Sharon Titanium Corp., presented a talk on "Titanium, Metal of Today and Tomorrow".

Mr. Vandenburgh's talk centered on the present production difficulties encountered in producing titanium in useful form from titanium sponge and its applications. The high affinity of titanium for oxygen makes most refractories unsuitable for furnace linings since most refractories are oxides and would be reduced by the action of titanium. Carbon pickup from carbon block refractories also makes them undesirable. The present-type melting furnace uses the consumable electrode principle in which an electrode of titanium sponge is melted by an arc drawn between the electrode and a water-cooled copper crucible which also acts as the mold. Hydrogen causes embrittlement and, to aid in eliminating hydrogen and prevent further contamination, the melting process is carried out under vacuum. The titanium ingots are hot rolled to sheets on hand mills.

In 1955 the tonnage of titanium mill products was approximately 2000 tons, with the majority going into military aircraft. Titanium is 40% lighter and as strong as steel up to approximately 800°F. and is used as an intermediate metal between aluminum and steel for high-temperature applications to reduce weight of aircraft.

The properties of high strength, light weight, and high corrosion resistance will give titanium many commercial applications when the price, approximately $30,000 per ton for sheet, can be reduced and production increased. Investigations now under way to reduce the cost of refining and processing of titanium and the production facilities now being planned, indicate titanium will be available economically for many commercial applications within a few years.—**Reported by A. J. Fletcher for Mahoning Valley Chapter.**

Presents Past Chairman's Certificate

National President A. O. Schaefer (Right) Presented a Past Chairman's Certificate to Morris Cohen, Massachusetts Institute of Technology, During the National Officers Night Meeting Held Recently by Boston Chapter

Details Sejournet Process For Steel at Meeting Of Chicago-Western Group

Speaker: F. A. Gougler
H. M. Harper Co.

"The Sejournet Extrusion Process for Steel" was the subject of a talk given by F. A. Gougler, development engineer, Metals Division, H. M. Harper Co., before a meeting of the Chicago-Western Group.

In the Sejournet process, the surface material of the steel billet is first removed, after which the billet is heated to its plastic range. Before being loaded into the extrusion press, however, the billet is coated with a layer of molten glass which serves as both a lubricant and an insulator preventing localized cooling. Because of the greatly reduced friction when compared to other extrusion methods, the steel can be forced through the die orifice at much higher speeds with a smaller ram force. And since no shell is left after extrusion, material utilization is more complete.

Although having only been done commercially in this country since 1952, the extruding of steel using glass as a lubricant has given evidence of becoming an increasingly important process. Some of the advantages over other methods pointed out by Mr. Gougler are a much lower cost when dealing with small quantities because of low cost dies and rapid die changes, the ability to produce nonrollable shapes and the satisfactory extrusion of extremely high-melting temperature alloys.—Reported by R. A. Norbut for Chicago-Western Group.

Speaks at Detroit Atomic Energy Night

Technical Chairman I. A. Rohrig (Left) of Detroit Edison Co., Opens the Discussion Following a Talk on "Metallurgy for Nuclear Reactors" Presented by W. D. Manly (Right), Metallurgy Division, Oak Ridge National Laboratory, at the Atomic Power Night Meeting Held by the Detroit Chapter

Speaker: W. D. Manly
Oak Ridge National Laboratory

W. D. Manly, associate director, Metallurgy Division, Oak Ridge National Laboratory, presented a talk on "Metallurgy for Nuclear Reactors" at the **Detroit Chapter's** Atomic Power Night.

Mr. Manly briefly described the various types of reactors and presented data on the properties of the various elements, including their neutron capturing ability, which determines to a large extent their use as materials of construction in the various parts of a reactor.

A comparison was made between the nuclear reactor and the automobile engine. Mr. Manly proceeded to design a hypothetical engine, listing fuel, coolant, control, moderator, shield and structure as essentials to any reactor. For this hypothetical engine he chose natural uranium as the fuel. The coolant suggested was liquid sodium as a primary source and liquid sodium and potassium as the secondary source, generating steam for the engine. Control rods of boron carbide-iron composition were indicated for maintaining the proper neutron flux to regulate the heat output of the reactor. The moderator could be sodium hydroxide with nickel as a material of construction. A shield must be provided to absorb the gamma radiation and Mr. Manly proposed using lead for this purpose. The various components of the reactor must finally be contained in a suitable structure.

W. W. Brown of the Detroit Edison Co., the coffee speaker, described the proposed atomic energy steam-electric power plant to be erected by his and associated companies. This is to be a fast breeder reactor type using liquid sodium as the primary heat transfer medium and a mixture of liquid sodium and potassium as the secondary heat transfer medium. This, in turn, will generate steam to operate the turbines of the electric generating plant. A color plastic model of the proposed nuclear power plant served to illustrate the talk.—**Reported by C. A. Siebert for Detroit Chapter.**

New Jersey Chapter Continues Broad Scope Of Vocational Assistance

Eight technical and vocational high schools in Northern New Jersey are giving outstanding support to A.S.M.'s broad program of education at the vocational high school level. Actually, this is the 13th year in which the New Jersey Chapter has conducted the John F. Wyzalek Awards for scholastic achievement in skilled trade courses involving the study of metals technology.

Vocational and technical high schools in Elizabeth, Bayonne, Bloomfield, Irvington, Newark, New Brunswick, Perth Amboy and Paterson have cooperated with the New Jersey Chapter in the establishment of metals technology as an integral part of courses in airplane mechanics, machine shop, drafting and design, and tool and die making. In these technical and trade courses, a minimum of 100 hr. per year has been spent as the study program.

The State of New Jersey has been active in its cooperation with the New Jersey Chapter and has issued a report on the program's result.

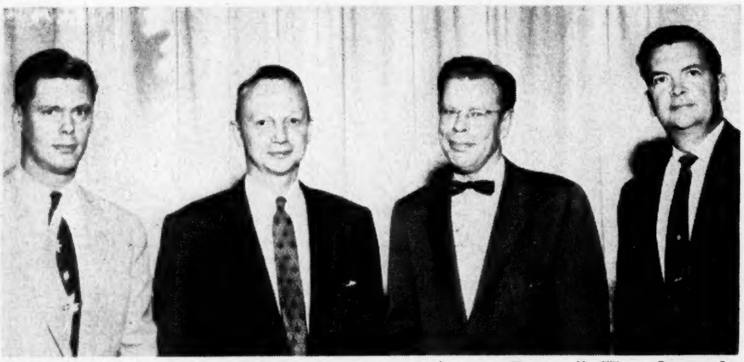
Arthur B. Wrigley, supervisor of vocational high schools, in cooperation with Alfred Bornemann and Max Heberlein, made a full-scale survey of participating schools, reporting that well-organized units in metals technology were provided in each school. Mr. Wrigley's survey also indicated constant expansion to improve the program.

The suggestion of extending the metals technology unit to 12th grade students in sheet metal, plumbing and auto mechanics is considered a definite possibility. Schools not properly equipped for providing metals technology instruction are making efforts to obtain additional equipment.

In the eight schools participating, of the total of 239 students enrolled in five skilled trades which involve the use or handling of metals, 158 are enrolled in metals technology.

The conclusions to Mr. Wrigley's report very clearly point out the fact that the New Jersey Chapter has been conducting a highly effective program of teaching metals technology in the vocational and technical high schools.

Reviews Geneva Conference



"A Review of the Geneva Conference on Atomic Energy" Was Given by William J. Jackel, Manager of the Albuquerque Operations and Vice-President of Nuclear Energy Products Division, ACF Industries, at a Meeting Held by the Albuquerque Chapter. Pictured are, from left: Keith E. Mead, chairman; Mr. Jackel; James R. McRae, Sandia Corp., who introduced the speaker; and Robert S. Lemm, Sandia Corp., who was program chairman

Speaker: W. J. Jackel
American Car & Foundry

A joint meeting of the **Albuquerque Chapters** A.S.M. and the American Society of Tool Engineers featured a review of the Geneva Conference on the "Peaceful Uses of Atomic Energy" by William J. Jackel, manager of the Albuquerque Operations of American Car and Foundry Industries and vice-president of the Nuclear Energy Products Division, ACF Industries.

Mr. Jackel, who attended the Conference in Geneva, Switzerland, as a representative of his company, divided his presentation into three phases. The first phase, which was of particular interest to the numerous ladies present in the audience of 150 persons, consisted of a general description of the conference site, the city of Geneva, and the surrounding countryside. This phase was illustrated by numerous colored slides taken by the speaker. The high light of the exhibit was the "swimming pool" type reactor in operation as a part of the U. S. exhibit. This reactor, housed in a separate building, "stole the show" in Mr. Jackel's opinion.

The second phase of the presentation dealt with the over-all technical aspects of the Conference. More than 1000 technical papers were presented during the Conference, dealing in three main categories. These were the technical and physical aspects of atomic reactors, chemistry and metallurgy of nuclear power and radio-isotope techniques related to medicine, agriculture and industry. Of the 1000 papers, 170 were presented by the U. S., 80 by the U.S.S.R. and 70 by the United Kingdom. The content of these technical papers and the extensive exhibits indicated that, in spite of security regulations, the research and development processes as practiced by the major powers have led to a common approach to most of the solutions to problems of peaceful utilization of atomic energy. There was concrete evidence that the larger nations are all making definite plans to develop a sizeable portion of their future power expansions by nuclear power reactors. The United Kingdom, for example, because of the high cost of conventional power, has plans to develop 30% of their over-all power requirements in 1980 by atomic reactors. In order to accomplish this objective they have "frozen" their current designs to enable earlier construction of reactors which may be obsolete by comparison with some U. S. models now being developed.

The third phase of Mr. Jackel's presentation was the description of the technical aspects of five different power reactors now being built and developed by various laboratories and industrial firms in cooperation with the AEC's five-year plan. The five reactors were identified as pressurized water, boiling water, aqueous homogeneous, sodium graphite, and plutonium breeder reactor. Another reactor of interest described by Mr. Jackel was the Army packaged power reactor designed to be transported to remote areas as a source of electrical power. Extensive use of slides was made to illustrate the operating principles and advantages and disadvantages of the different types of reactors.—**Reported by D. W. Ballard for Albuquerque Chapter.**

has produced and makes available, for showing before chapters and educational institutions, moving picture films pertaining to metals.

Talks on Brazing of Jet Engine Parts

At a Meeting Held by Montreal Chapter, R. L. Peaslee, Left, Vice-President, Wall Colmonoy Corp., Spoke on "Brazing of Jet Engine Components for High-Temperature Service". At right is J. J. Waller, chapter chairman

Speaker: R. L. Peaslee
Wall Colmonoy Corp.

At a recent meeting of the **Montreal Chapter,** R. L. Peaslee, vice-president, Wall Colmonoy Corp., presented a talk on the "Brazing of Jet Engine Components for High-Temperature Service".

Mr. Peaslee pointed out that brazing has always been behind the better known welding methods in development. However, recent attention, especially in the field of jet engines, has brought brazing in as the designer's choice in preference to other "assembly" methods.

Slides were shown illustrating multijoint brazing of such parts as fuel nozzles, stator vanes and turbine blades joined with a nickel-chromium brazing alloy. Multiple joints can be brazed in one operation by use of a furnace with reducing atmosphere. Pure dry hydrogen is often used in a sealed retort. Retorts have been constructed up to 72 in. in diam. by 72 in. high.—**Reported by Rafe Sherwin for Montreal.**

Presents Educational Series on Metallurgy of Welding at Oak Ridge

Speakers: Warren F. Savage Ernest F. Nippes and Chris Floyd

An educational lecture series on the "Metallurgy of Welding" was recently presented by the **Oak Ridge Chapter.** The course consisted of three evening lectures, sponsored in cooperation with the East Tennessee Chapter of the American Welding Society and the Division of University Extension, University of Tennessee. The total attendance for the series was 95, of which 84 were not A.S.M. members.

The lectures, which were slanted toward persons without extensive metallurgical background, were designed to cover basic metallurgical principles in the welding of ferrous and nonferrous metals and alloys. An understanding of phase diagrams, together with the principles of heat treatment and the alloying of metals, was provided and then employed to explain the effects of thermal cycles associated with welding on the microstructure of weldments. Following the final meeting, an open house featuring laboratory exhibits and demonstrations was held in the metallurgy division of the University of Tennessee.

Speakers for the series were Warren F. Savage, associate professor of metallurgical engineering and supervisor of welding research, and Ernest F. Nippes, professor of metallurgical engineering and director of welding research, Rensselaer Polytechnic Institute, and Chris Floyd, chief metallurgical engineer, Boiler Division, Babcock & Wilcox Co.

Dr. Savage defined the properties which classify metals as favorable structural materials and explained the significance of phase diagrams to the study of metal systems. Possible mechanisms for changing metallic properties, such as solid solution alloying, various heat treating techniques and annealing treatments were also discussed.

Dr. Nippes continued the discussion of basic metallurgical principles, speaking specifically on the heat treatment of steels. The effects of temperature cycles on grain size, hardness and tensile properties were covered and were extended to analogous situations encountered in welding. Temperature profiles were shown for typical welds and the resulting microstructures described.

The final lecture by Mr. Floyd concerned the properties of welding electrodes and recommended practices in the welding of chromium-molybdenum and stainless steels. The effects of the use of low-hydrogen electrodes on metallurgical properties were discussed, followed by a review of several important welding problems encountered by the speaker and their ultimate solution. Included were techniques being used in the welding of austenitic stainless steels.—**Reported by J. H. DeVan for Oak Ridge.**

Explains Trace Elements In Metals at Fort Wayne

Speaker: Jerome Strauss

Vanadium Corp. of America

Jerome Strauss, vice-president and chief technical adviser of Vanadium Corp. of America, spoke on "Trace Elements in Metals for Better or for Worse" at a recent meeting of **Fort Wayne Chapter.**

In opening, Mr. Strauss mentioned the tremendous influence effected upon metals and alloys by the small additions of other metals or elements. Interest in this fact is brought to the fore because the behavior of certain semiconductors led to the development of the transistor which has great future in communications equipment as well as in harnessing solar energy, and, also, by the development and widespread use of steels treated with boron-containing alloys.

Proper treatment of lean alloy steels with boron-containing alloys to an end product content of 0.0005% boron results in increased hardenability of the steel to the extent that the resulting boron-treated steel can replace steels of richer alloy content. The phenomenon of the effects of the boron addition is partially explained as follows: After effective aluminum deoxidation of the steel, a little aluminum in the alloy serves to keep any subsequently introduced oxygen from reacting with the remaining alloy components; its titanium is then available for combination with nitrogen, leaving the boron to perform its function of increasing the hardenability of the steel by whatever means the future may disclose. At the present, there are a number of theories as to the exact means by which boron does perform this function. The key combination is titanium-boron in the added alloy. This has been proven by every subsequent commercial development.

The semimetal, or semiconductor, silicon, is used extensively in that present day wonder, the transistor (which replaces electronic vacuum tubes). It has been found, Mr. Strauss stated, that the conductivity of this high-purity silicon is improved about 60-fold by boron addition to 0.001% boron and about 360-fold by addition to 0.01% boron. Phosphorus at 0.029% improves conductivity 100 times, and with double this addition conductivity is improved over 300 times. These two elements contribute to the movement of electrical charges by boron being a donor of electrons to the silicon and phosphorus being an acceptor of electrons from the silicon.

Of the many examples of the effects of minute additions, Mr. Strauss also spoke of the effect of small amounts of tin added to aluminum copper alloys containing manganese, either a little or several per cent silicon with or without nickel; specifically, an alloy of the duralumin variety (4.4% copper, 0.8% manganese, 0.8% silicon) with a small amount of tin will develop, by heat treatment, the customary 65,000 psi. tensile strength, but with the high yield ratio of over 80%. The tin addition may be as little as 0.005%, although a few hundredths are preferred. Magnesium as an impurity is detrimental to this high yield ratio and must be held to less than 0.005% for best mechanical properties. However, if this contamination does occur and the magnesium rises to a few hundredths of 1%, as little as 0.05% cadmium added will restore the original properties.—**Reported by J. P. Crosbie for Fort Wayne.**

President Addresses Boston Chapter

At Boston Chapter's National Officers Night Meeting, A.O. Schaefer, President A.S.M. and Vice-President in Charge of Engineering and Manufacturing, Midvale Co., Gave a Talk on "Manufacture and Heat Treatment of Large Forgings". Shown, from left: Morris Cohen, past chairman; Mr. Schaefer; J. L. Morosini, chairman; and W. F. Collins, program chairman

Hear Reactor Cladding Materials Talk

Past Chairmen of the Rocky Mountain-Denver Chapter Who Heard a Talk on "Reactor Fuel Cladding Materials" Which Was Presented by P. J. Pankaskie, General Electric Co., Included, From Left: S. Mark Davidson, Roy Higson, J. K. Garretson, Floyd Anderson, Curtis C. Drake, C. B. Carpenter, William J. Holtman, George Lundberg and James Colasanti

Speaker: P. J. Pankaskie
General Electric Co.

P. J. Pankaskie of the Commonwealth Edison Project of General Electric Co., presented a talk on "Reactor Fuel Cladding Materials" at a meeting held by **Rocky Mountain Chapter** in Denver.

The speaker reviewed G.E.'s history in the nuclear energy field, beginning with the operation of the Hanford Nuclear Works and the submarine reactor at West Milton, N. Y. G.E. is now associated with five utility companies and an engineering firm known as the Nuclear Power Group. The Commonwealth Edison Project will design a central station power plant with a capacity of 180,000 kw. This is a boiling reactor making use of pressurized water at 1000 psi., the steam being fed directly to the turbine. It is planned that this plant will be built near Chicago by 1960.

Mr. Pankaskie, as a metallurgist, is primarily concerned with the reactor materials, particularly fuel cladding materials. There are six important classes of materials: structural, shielding, control, moderator, fuel and fuel cladding. The structural materials are those used in conventional high-temperature applications. To control hazardous conditions resulting from X-rays or neutrons, high-density shielding materials, such as high-density concrete, lead, or perhaps depleted uranium, are used.

Reactor control materials are characterized by a high neutron absorption cross section such as cadmium, boron or hafnium. To increase the efficiency of the fission, materials containing light elements, such as beryllium, carbon, hydrogen or deuterium, act as moderators to slow the fission neutrons. Materials with low neutron absorption cross section are particularly useful in increasing neutron economy. Fuel materials for thermal reactors are limited to U^{235} and U^{233}, the latter being formed from the neutron bombardment of thorium.

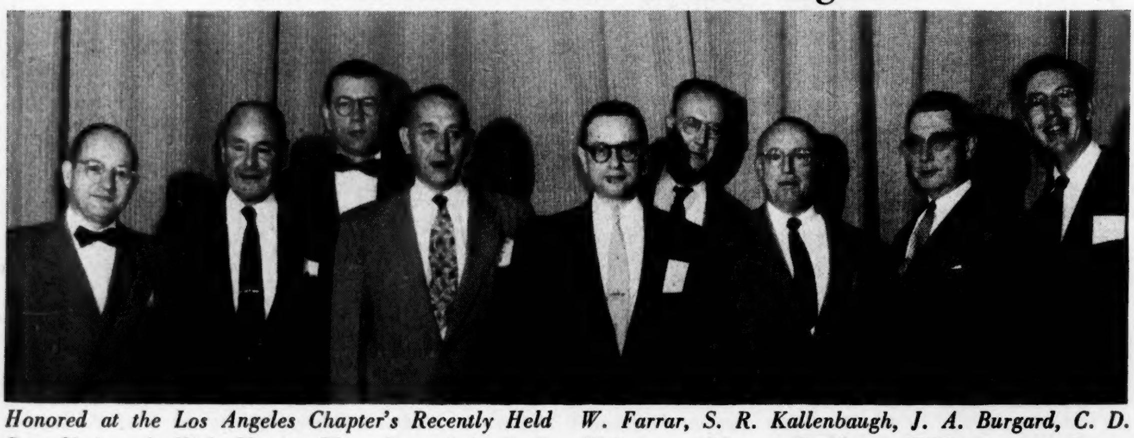
The primary purposes of reactor fuel cladding materials are to prevent the corrosion of the fuel materials which are usually very reactive with the reactor coolant and to contain fission products which are highly radio-active and may contaminate power plant equipment. The basic requirêments for cladding materials are low neutron cross section, corrosion resistance to coolant at operating temperature, minimum mechanical strength, nominal replacement costs, and no physical interaction with fuel. This latter point may be important in that interdiffusion may form an alloy with very poor properties or permit the escape of fuel or fission product atoms into the coolant stream. A possible method of overcoming this problem is by using a barrier material to prevent interdiffusion.

Of the many possible metals available, aluminum, zirconium and stainless steel seem most useful. Aluminum is limited to low-temperature use; however, an aluminum-nickel alloy appears promising for service to 600° F. in water. Zirconium and stainless steel are useful for elevated-temperature use. The choice between the two must be resolved on the basis of cost and neutron economy, zirconium being more costly while stainless steel has the higher neutron capture cross section.

In the case of aluminum, its interdiffusion with uranium is very rapid, giving a product which is spongy and crumbly. Similarly the iron from the stainless steel forms a eutectic with uranium which melts at about 1200° F. To overcome these difficulties, one may prevent operation at such elevated temperatures, redesign the fuel elements to prevent such temperature, or use a secondary cladding. The secondary cladding may be a very thin layer of another metal which will not interdiffuse with either the cladding or the uranium.

Thus, to properly design fuel elements for a nuclear reactor, one must consider the above factors carefully, trying to balance corrosion resistance, interdiffusion, neutron economy, cost and availability.—**Reported by H. P. Leighly, Jr., for Rocky Mountain-Denver Chapter.**

Past Chairmen Gather at Los Angeles



Honored at the Los Angeles Chapter's Recently Held Past Chairmen's Night Meeting Were, From Left: D. C. Clark, Presently National Vice-President A.S.M., W. W. Farrar, S. R. Kallenbaugh, J. A. Burgard, C. D. D'Amico, Edgar Brooker, William A. Laury, Fred J. Robbins and Franklin L. Stamm

Talks on Nondestructive Testing at Meeting Held By N. E. Pennsylvania

Speaker: Alexander Gobus
North American Phillips Co.

"Nondestructive Testing" was the subject of a talk delivered before the **Northeast Pennsylvania Chapter** by Alexander Gobus of the Research and Control Division, North American Phillips Co.

The speaker's opening comments dealt with a general description of ultrasonic testing methods in which the cyclic frequency is in the region of 5×10^6 cps. These methods are used to locate subsurface discontinuities which have appreciable width. Narrow defects parallel to the sound waves are not easily detectable by the ultrasonic methods.

The detection of surface cracks is limited to the magnetic particle or penetrant methods. Magnetic particle methods may also be used to some extent in detecting subsurface defects. The first penetrant inspection processes required lengthy soaking time in the penetrating oil and the use of ultraviolet light for surface defect detection. More recent processes have reduced the soaking period to a few minutes and produce defect indications plainly visible in ordinary light.

The speaker described the eddy-current method of nondestructive testing by which changes in hardness, grain size or chemistry may be detected if other variables are held constant. This method of inspection is most useful for high production items.

In discussing the radiographic testing methods, the speaker touched on the history and development of radiography and related equipment and mentioned some of the precautions to be observed in their use. Fluoroscopy, which is filmless radiography, was described as a method becoming more popular in industry. Electronic fluoroscopy produces images at 1200 × as bright as previous fluoroscopic screens. A penetrameter sensitivity of 2½% on 1¼-in. thick steel is obtainable with units up to 150 kv. The operation of these units was described by the use of lantern slides.

Radiographic methods using isotopes were discussed. Although cobalt-60 has a relatively low cost and long life, it is limited to metal thicknesses of about 2 in. and greater. Radium, which is much more costly but which can be rented, is suitable for radiographic inspection of materials down to a minimum thickness of ¾ in.—**Reported by A. J. Babecki for Northeast Pennsylvania.**

Ⓢ has an annual budget in excess of one million dollars.

At Birmingham's Annual Ladies Night

Shown at the Annual Ladies Night Meeting in Birmingham Are Chapter Officers and Their Wives, Including, From Left: Mrs. and Vice-Chairman Robert Bertossa; Mrs. and Chairman Ralph Carlson; Secretary-Treasurer and Mrs. Sanford Enslen; and Program Chairman and Mrs. Bruce Jones

Golden Gate Hears Talk On Nondestructive Tests In Heavy Manufacturing

Speaker: W. J. Erichsen
Westinghouse Electric Corp.

W. J. Erichsen, manager, metallurgical laboratory, Westinghouse Electric Corp., presented a talk on "Nondestructive Test Methods as Applied in Heavy Manufacture" at a meeting which was held recently by the **Golden Gate Chapter.**

The application of nondestructive tests to products ranging in size from pole-type distribution transformers to the world's largest rotating machinery—five axial flow wind tunnel compressors for the U. S. Air Force—was discussed, with emphasis on the cost savings possible through nondestructive testing. The fact that nondestructive testing is an effective tool in reducing shop costs and in keeping a manufactured product competitive was based on the following factors:

Reliability of a product in service provides for safe, trouble-free operation with a minimum of corrective field work required.

Manufacturing costs can be reduced by inspection of raw materials as soon as they enter the plant or as early in the manufacturing process as possible. In this way, defective material can be weeded out before a large amount of work is done.

Production costs can be lowered through the role of nondestructive testing in the laboratory or shop to speed the development of new products or analyze problems and study processes which may be contributing to high rejection rates or repair costs.

Costs can also be reduced due to the possibility of saving weight of metal through nondestructive testing because of the fact that more intelligent safety factors can be utilized.

Case histories and examples of the application of nondestructive tests to products and in metallurgical trouble shooting were cited. Nondestructive tests discussed included microscopic, radiographic, magnetic particle and ultrasonic. Fluid pressure, leak and liquid penetrant tests, as well as chemical spot tests, including oxide and sulphur contact printing, were also discussed.—**Reported by R. D. Failor for Golden Gate Chapter.**

A.S.M.-A.F.S. Meet at Michigan State

A. H. Karpicke, Chief Metallurgist, Saginaw Malleable Iron Co., Spoke on "Current Problems and New Developments in the Production of Malleable Iron Castings" at a Joint Meeting of the American Society for Metals and the American Foundrymen's Society Held at Michigan State University. Shown, from left: Douglas Harvey and H. L. Womochel, Michigan State University; Richard Dobbins, Albion Malleable Iron Co.: Mr. Karpicke; Charles Sigerfoos and R. L. Sweet, M.S.U. (Reported by Rennie Swope)

Talks on Titanium at Oak Ridge

James C. Wilson, Technical Chairman (Left), and T. W. Lippert, Titanium Metals Corp. of America, Who Spoke on the "Fabrication and Application of Titanium", Are Shown at a Recent Meeting at Oak Ridge Chapter

Speaker: T. W. Lippert

Titanium Metals Corp. of America

"Fabrication and Applications of Titanium" was the title of an address given by T. W. Lippert of Titanium Metals Corp. of America to the **Oak Ridge Chapter.**

The speaker traced the growth of the titanium industry in this country during the past five years to its present stage in which two major producers are producing about 3600 tons annually. The titanium industries in Japan and in Great Britain are growing at a rapid rate.

The strength-to-weight ratio and high melting temperature of titanium explain why the aircraft industry is the major consumer of this metal.

The hydrogen-embrittlement problem which caused titanium to lose many friends more than a year ago has been solved by large-scale vacuum-annealing of all fabricated parts at 1-2 microns at 1400° F. Hydrogen content has been reduced to as low as 75 ppm. by this treatment.

The rolling of titanium sheet in sizes as large as 36 by 96 ft. looms as a major fabrication problem. Existing equipment will have to be modified or new equipment will have to be made to accomplish such fabrication feats as this and still insure a flat product. Obviously, a large amount of development work will be required before this will be realized. **—Reported by Burl Cavin for Oak Ridge Chapter.**

Donates Memberships to Students

Loel L. Judy, Chief Heat Treater, Overhaul and Repair Department, Naval Air Station, Donated Two A.S.M. Memberships to Douglas W. Speed and Charles W. Whidden, Outstanding Students at the University of Florida, During a Recent Meeting Held by Jacksonville Chapters A.S.M. and A.S.M.E.

Presents Historic Survey Of Metals at Columbia

Speaker: John H. Hollomon

General Electric Research Laboratory

At a meeting of the **Columbia Basin Chapter,** John H. Hollomon, manager of the metallurgy and ceramics research department of the General Electric Research Laboratory, presented an historical survey of the development of metallurgy entitled "Who, When, Where of Metallurgy?"

Dr. Hollomon traced the course of metallurgy from its beginnings about 6000 years ago in the Middle East where copper ore was first reduced (probably accidentally) and bronze became available as a working material. He discussed the alchemy of the middle ages when the interest was in transmutation of the common metals into more valuable ones. This age, of chemistry and chemical metallurgy, began with attempts to understand ore processing and refining.

A major advance in metallurgy came about in 1850 when, as a result of developments in inorganic chemical technology, iron was first produced cheaply in blast furnaces and steel from openhearths.

Parenthetically Dr. Hollomon noted that the smith and others who worked with metals were regarded very highly in some communities, while in others these practitioners of the mysterious metallurgical arts were treated as highly suspicious characters.

Around 1900, another major advance in metallurgy was taking place. The "polish and peep" metallurgist, with his microscope, appeared on the scene, along with the discovery that structure could be far more important in its effect on metal properties than the chemical composition. Just as the laboratory processes of the alchemists had been reduced to plant practice in earlier times, the control of structure came also to be carried out in the factories.

Next came the discovery of the effects of preferred orientation on the properties of metals and the reduction of orientation control to commerical practice. In transformer cores, for instance, we have 98% alignment of the metal grains. Other processes allowing grain refinement and the control of graphite structure in cast iron were described.

In conclusion, Dr. Hollomon pointed out we could expect the day to be not far off when the users of metals would be specifying the number of atomic defects in the metals they order. This is already being done in the case of germanium and the day is coming when it will also be true for other metals.

A movie entitled "Crystal Growth" was shown. Dr. Hollomon also discussed new work related to dislocations in metals and their identification.**—Reported by D. P. O'Keefe for Columbia Basin.**

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared by the Technical Information Division of Battelle Memorial Institute, Columbus, Ohio

A General Metallurgical

87-A. Metallurgy. H. A. Holden. *Chemical & Process Engineering,* v. 37, Jan. 1956, p. 17-20.

Review covering recent developments in aluminum and aluminum alloys, titanium, ferrous and nonferrous alloys, protective treatments, processes and tests of metals. Photographs. 77 ref.
(A general, Al, Ti, ST, EG-a)

88-A. Britain's Place in World Engineering. II. Raw Materials: Consumption and Price. *Engineering,* v. 181, Jan. 13, 1956, p. 45-47.

Analysis of consumption and price trends and their effect on the engineering industry. Graphs.
(A4, Cu, Al, ST, Sn, Ni)

89-A. Westinghouse Metallurgical Plant at Blairsville, Pa. Warren M. Trigg. *Industrial Heating,* v. 23, Jan. 1956, p. 70 + 7 pages.

New pilot plant provides complete range of processing equipment in step toward producing new and better metals and metallurgical processes for use in electrical industry. Plant design and operation. Photograph, diagram. (A5, T1)

90-A. Cleaning of Open Hearth Stack Gases: II. Leslie Silverman. *Industrial Heating,* v. 23, Jan. 1956, p. 96, 98, 100, 102.

Continuously formed recycled filter method using fine fiber slag wool gives satisfactory performance. Diagram. (To be continued.)
(A8, D2, ST)

91-A. More Nickel Seen Available for Industry in '56 With Free World Output at 442,000,000 Lb. John F. Thompson. *Metals (Daily Metal Reporter Monthly Supplement),* v. 26, Jan. 1956, p. 7-8, 19.

Distribution, prices, applications, plating supplies and outlook for 1956. (A4, Ni)

92-A. Copper Outlook in 1956 Called Promising With Rough Balance Expected in Supply and Demand. *Metals (Daily Metal Reporter Monthly Supplement),* v. 26, Jan. 1956, p. 9-10.

Effect of strikes on industry, world condition governing copper supply and consumption, newly completed mining projects which will add substantially to production capacity, shortcomings of substitutes, reserves, future outlook.
(A4, Cu)

93-A. An Aluminum Distributor Looks Ahead. E. A. Farrell. *Modern Metals,* v. 11, Jan. 1956, p. 40, 44.

Trends toward warehouse distribution of less-than-carload lots, free delivery system, expansion of services to cater to do-it-yourself trade and to small fabricator are anticipated by industry's all-aluminum distributor. (A4, A5, Al)

94-A. Forecast for Light Metals in 1956. *Modern Metals,* v. 11, Jan. 1956, p. 86-88, 90-91.

Discusses record production of aluminum, magnesium and titanium during 1955, new plants and expansion planned by various light metals producers and fabricators for 1956 and alloys being developed and new applications anticipated.
(A4, Al, Mg, Ti)

95-A. Abating Noise in Steel Tank Fabricating Shop. Francis A. Westbrook. *Steel Processing,* v. 42, Jan. 1956, p. 21, 59.

How one factory solved severe noise problem by use of Fiberglas baffle plates suspended vertically from parallel steel wires running length of building. In this way they did not interfere with overhead traveling cranes, light fixtures or skylights. Additional baffles were hung from wires in alternate bays close to walls on both sides of interior. Noise reduction by this method was greater than 50%. Phototgraphs.
(A7)

96-A. What Warehouse Service Means to Magnesium Users. Ralph W. Shaw, Jr. Paper from "The User Speaks About Magnesium". Magnesium Association, 6 p. + 1 plate.

Enumeration of the values of warehouse storage and supplying of magnesium to industry. Photograph. (A5, Mg)

97-A. (English.) **The Use of Tubes in the Materials Handling Industry.** G. B. Stewart. *Acier, Stahl, Steel,* v. 20, no. 12, Dec. 1955, p. 487-489.

Considers only the equipment for handling processed or semiprocessed goods and gantries for conveyor belt systems. Photographs.
(A5, T5, ST)

98-A. (Czech.) **Basis for Designing and Planning Hygienic Technical Equipment in Foundries.** Josef Mejstrik. *Slévarenstvi,* v. 3, no. 12, Dec. 1955, p. 391-395.

Temperature conditions and ventilation which govern efficient foundry design. (A7, E general)

99-A. (Russian.) **Quaternary Mutual Systems Consisting of Fluorides and Chlorides of Sodium, Potassium, Calcium and Barium as the Basis of Fluxes for Remelting Light Metal Scrap.** G. A. Bukhalova and A. G. Bergman. *Zhurnal prikladnoi khimmi,* v. 28, no. 12, Dec. 1955, p. 1266-1274.

Efficacy of fluxes for remelting and refining of aluminum scrap, especially in elimination of oxide and nitride films. Graphs, diagrams, tables. 7 ref. (A8, C21, Al)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

100-A. The Process Equipment and Protective Enclosures Designed for the Fuel Fabrication Facility—Facility #350. A. B. Shuck and R. M. Mayfield. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5499, Jan. 1956, 160 p.

Report on concepts, design, mock-up construction and testing of equipment and hoods for the fabrication of reactor fuels containing plutonium or U^{233}, with particular emphasis on the process equipment requirements, radiological and toxicological hazards, hooding concepts, hood designs and construction. Diagrams, photographs, tables.
(A7, A5, Pu, U)

101-A. The Current Work of the British Non-Ferrous Metals Research Association. G. L. Bailey. *Birmingham Metallurgical Society, Journal,* v. 35, Dec. 1955, p. 322-344.

Review of organizations and activities. Research projects include studies of blistering in brass sheet, stretcher strain markings in aluminum alloys and properties of cast metals. Diagrams, graphs, photographs, micrographs. (A9, EG-a)

102-A. Reactor Heat Transfer Information Meeting Held at Brookhaven National Laboratory, October 18-19, 1954. *Brookhaven National Laboratory, Division of Engineering (U. S. Atomic Energy Commission),* BNL 2446, Dec. 1955, 194 p.

Twelve papers on various phases of heat transfer. Pertinent papers abstracted separately. Diagrams, graphs, micrographs, tables.
(A general)

103-A. A Method for Recovery of Zinc Plating Solutions. *Finish,* v. 13, Feb. 1956, p. 19, 81.

Double effect evaporator has proved to be an economical way of recovering zinc, supplying distilled rinse water and eliminating stream pollution. Photographs, flow diagram. (A8, L17, Zn)

104-A. Steel Capacity. *Iron Age,* v. 177, Feb. 2, 1956, 6 p.

Coke, ingot, blast furnace and steel production capacities for companies and districts. Tables.
(A4, D general, ST)

105-A. Pittsburgh Steel's New Hot and Cold Strip Mill at Allenport, Pa. H. A. Long and J. C. Peth. *Iron and Steel Engineer,* v. 33, Jan. 1956, p. 57-66; disc., p. 66.

Addition of flat rolling mills has reduced fluctuation in the company's

operations and a much more satisfactory product mix has been obtained which should result in more profitable operations. Mill units and layout described. Diagrams, photographs, tables. (A5, F23, ST)

106-A. Scope of the Furnace Fume Control Problem. H. L. Richardson. *Iron and Steel Engineer,* v. 33, Jan. 1956, p. 105-111.

Different types of gas cleaning equipment, and methods and problems in their applications to steelmaking facilities to provide visually clean stack discharges. Photographs, graph, diagrams. 3 ref.
(A8, D1, D2, ST)

107-A. Development in the Iron and Steel Industry During 1955. I. E. Madsen. *Iron and Steel Engineer,* v. 33, Jan. 1956, p. 119-166.

Reviews production of iron and steel during 1955. Trends in expansion of facilities and collateral trends in availability of alloy materials, coke and ore. New processes, equipment, layouts. Tables, graph, photographs, diagrams.
(A general, D general, ST, Fe)

108-A. The Structural Iron of the Parthenon. C. J. Livadefs. *Iron and Steel Institute, Journal;* v. 182, Jan. 1956, p. 49-66. (Translated from the Greek by E. K. Mazijoglou.)

Representative samples of Parthenon iron (two dowels and two clamps) studied by metallographic, mechanical and chemical testing. The paper takes full account of ancient Greek writings dealing with ferrous metallurgy and the work of previous investigators. Photographs, tables, micrographs, diagrams. 16 ref. (A2, Fe)

109-A. French Aluminum Developments in Africa. *Light Metals,* v. 19, Jan. 1956, p. 26-27.

Facilities and production of French African aluminum plants, ore sources and available power. Map, photographs. (A4, B10, Al)

110-A. A Dictionary of Metallurgy. A. D. Merriman and J. S. Bowden. *Metal Treatment and Drop Forging,* v. 23, Jan. 1956, p. 13-20.

Defines metallurgical terms from "rust prevention" to "S-curve." Tables, graphs diagrams. (A10)

111-A. Interrelation of Manufacture, Magnetic Properties, and Engineering Design of Magnetic Apparatus. T. J. Murrin. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 305-314.

A flow process chart outlines typical operations involved in processing of mill material into magnetic core structures. Information on the processing elements which cause deterioration of the basic properties of these strain-sensitive alloys. Diagrams, graphs. 19 ref.
(A general, P16, SG-n, p)

112-A. (Czech.) **Safe Handling of Radioactive Isotopes for Inspection Purposes.** T. Unger. *Strojirenstvi,* v. 5, no. 12, Dec. 1955, p. 928-933.

Standard instructions and maximum permissible radiation; design and calculation of protective housings and shields; methods of keeping tabs on radioactivity. Tables, graphs, photographs. 7 ref.
(A7, S19)

113-A. (Czech.) **Safety and Protection in Flame and Electric-Arc Welding.** Eduard Jiru. *Zvaranie,* v. 4, nos. 9-10, Sept. 1955, p. 301-305.

Effect of ultraviolet radiation on the eyes, infra-red radiation and welding fumes. Collective and individual safety rules and protective equipment. 7 ref. (A7, K1)

114-A. (Polish.) **Bases for Figuring Costs and for Calculations in the Metallurgy of Iron. I.** Robert Cop. *Wiadomosci hutnicze,* v. 11, no. 12, Dec. 1955, p. 386-389.

Types of costs, materials and fuels, labor and social security, power costs, services, permanent installations. Tables. (A4, ST, Fe)

115-A. Recovery of Dust and Fume From Metallurgical Gases. R. Bainbridge. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 17 p. + 11 plates.

Gas conditioning for dust recovery by electrostatic precipitation. Gas cooling for baghouse operation. Dust recovery from wet gas. Photographs, diagram, graphs, tables.
(A8, C21, Pb)

116-A. The Tata Iron and Steel Company, Ltd. L. N. Collins. *Blast Furnace and Steel Plant,* v. 44, Feb. 1956, p. 178-198.

Detailed description of Indian steel plant, its equipment and operation. Tables, photographs.
(A5, ST)

117-A. Expansion in Australian Steelmaking. W. P. Goodwin. *British Steelmaker,* v. 22, Feb. 1956, p. 40-43.

Review of Australian steelmaking industry. Photographs, map.
(A4, ST)

118-A. Aluminum. Delwin D. Blue and Horace F. Kurtz. *Bureau of Mines Minerals Yearbook, Preprint,* 1953, 21 p.

Review of domestic production, consumption and uses, stocks, foreign trade, prices, technology, and similar information from other countries. Tables, graphs. 41 ref.
(A4, Al)

119-A. Copper. Helena M. Meyer and Gertrude N. Greenspoon. *Bureau of Mines Minerals Yearbook, Preprint,* 1953, 56 p.

Domestic production, consumption, stocks, prices, foreign trade, technology, extensive review of world production information. Graphs, tables. 68 ref. (A4, Cu)

120-A. Ferroalloy. Robert W. Geehan. *Bureau of Mines Minerals Yearbook, Preprint,* 1953, 10 p.

Domestic production, prices, foreign trade, technology, foreign production. Tables. 17 ref. (A4, Fe)

121-A. Iron and Steel. James C. O. Harris. *Bureau of Mines Minerals Yearbook, Preprint,* 1953, 28 p.

Domestic iron and steel situation with a briefer review of world production figures. Tables, graph. 25 ref. (A4, ST, Fe)

122-A. Iron Ore. Jachin M. Forbes. *Bureau of Mines Minerals Yearbook, Preprint,* 1953, 30 p.

Domestic production, consumption and use, transportation, foreign trade, technology and industrial development, reserves, employment, world situation. Tables, graph. 17 ref. (A4, Fe)

123-A. Magnesium. H. B. Comstock. *Bureau of Mines Minerals Yearbook, Preprint.* 1953, 10 p.

Domestic production, consumption and uses, prices, foreign trade, technology, similar information from foreign countries. Tables, graph. 23 ref. (A4, Mg)

124-A. Manganese. Gilbert L. DeHuff. *Bureau of Mines Minerals Yearbook, Preprint,* 1953, 24 p.

Domestic production, consumption and stocks, foreign trade, and technology, world situation. Tables. graph. 36 ref. (A4, Mn)

125-A. Sodium and Sodium Compounds. Joseph C. Arundale and Flora B. Mentch. *Bureau of Mines Minerals Yearbook, Preprint,* 1953, 8 p.

Domestic production, consumption and uses, prices, foreign trade, technology, review of world situation. Tables. 20 ref. (A4, Na)

126-A. The National Mineral Results for 1955. H. McLeod *Canadian Mining Journal,* v. 77, Feb. 1956, p. 60-70.

Canadian mineral production and consumption statistics for 1955. Photograph, tables. (A4, B10)

127-A. 87th Annual Survey and Outlook. Major Metals. M. A. Kriz, Francis H. Wemple, Simon D. Strauss, Robert L. Ziegfeld, Charles R. Ince, Irving Lipkowitz, J. D. Hanawalt, Jack Kratchman, George H. Cleaver and Thomas W. Lippert. *Engineering and Mining Journal,* v. 157, Feb. 1956, p. 75-96.

Summary of production and consumption, imports and exports, price trends, uses, 1956 outlook for gold, silver, copper, lead, zinc, tin, uranium, aluminum, magnesium and titanium. Tables, graphs.
(A4, Au, Ag, Cu, Pb, Zn, Sn, U, Al, Mg, Ti)

128-A. 87th Annual Survey and Outlook. Ferroalloys. Hubert W. Davis, Gilbert L. DeHuff, Jr., Wilmer McInnis and R. W. Holliday. *Engineering and Mining Journal,* v. 157, Feb. 1956, p. 97-103.

Survey of ferro-alloys and nickel, cobalt, manganese, chromium, tungsten and molybdenum production, with data regarding prices, consumption, research, imports and exports. Tables.
(A4, Fe-n, Ni, Co, Mn, Cr, W, Mo)

129-A. 87th Annual Survey and Outlook. Minor Metals. Paul F. Yopes, Abbott Renick, H. T. Reno, Ottey M. Bishop, Joseph C. Arundale, James W. Pennington, James E. Bell, F. D. Lamb, Fred P. Giese and John E. Crawford. *Engineering and Mining Journal,* v. 157, Feb. 1956, p. 104-112.

Statistics regarding production, research, prices, imports and exports, consumption, applications, future outlook for the minor metals. Tables. (A4, EG-b)

130-A. Safe Handling of Alkali Metals. Marshall Sittig. *Industrial and Engineering Chemistry,* v. 48, Feb. 1956, p. 227-229.

Storage problems, protective equipment, housekeeping problems, and fire extinguishing with lithium, potassium and sodium. 17 ref.
(A7, EG-e)

131-A. Automatic Fire System Minimizes Paint Shop Risks. *Iron Age,* v. 177, Feb. 23, 1956, p. 94-95.

How one plant, once burned, set about hedging against future fire risks with improved equipment. Photographs. (A7, L26, ST)

132-A. Review and Outlook for the Iron Ore Industry. A. L. Fairley, Jr. *Mining Congress Journal,* v. 42, Feb. 1956, p. 62-64.

Statistics and economics for the iron ore industry. Photographs.
(A4, Fe)

133-A. Aluminum Outlook. Walter L. Rice. *Mining Congress Journal,* v. 42, Feb, 1956, p. 68-69.

Predicted outlook for aluminum industry, statistics and economics. Photographs. (A4, Al)

134-A. Uranium. Eric R. Rude. *Mining Congress Journal,* v. 42, 1956, p. 78-81.

One of the outstanding developments in 1955 was the high degree of participation of private industry in exploration, mining and processing. Photographs, map. (A4, U)

135-A. Copper. Helena M. Meyer. *Mining Congress Journal,* v. 42, Feb. 1956, p. 82-84.

High demand, strikes and rising prices characterize the past year in the copper industry. Photographs. (A4, Cu)

136-A. Lead. Wallace G. Woolf. *Mining Congress Journal,* v. 42, Feb. 1956, p. 89-90.

1955 was a year of intensified activity; outlook for 1956 is optimistic. Photographs, table. (A4, Pb)

137-A. The Zinc Industry in 1955. Howard Lee Young. *Mining Congress Journal,* v. 42, Feb. 1956, p. 92-93.

The statistical and economic activities of the zinc industry for 1955. Photographs, tables. (A4, Zn)

138-A. Titanium. C. I. Bradford. *Mining Congress Journal,* v. 42, Feb. 1956, p. 105-106.

Mill products output increased over 50% since 1954 and greater proportionate increase is predicted for this year. Photographs. (A4, Ti)

139-A. Strategic Metals. S. H. Williston. *Mining Congress Journal,* v. 42, Feb. 1956, p. 119-121.

Improved government minerals policy is required or the domestic strategic metals industry faces a shut down. An economical and statistical report. Photographs. (A4, W, Hg, Sb, Cr, Mn)

140-A. Magnesium. Jerry Singleton. *Mining Congress Journal,* v. 42, Feb. 1956, p. 142-143.

Steady growth in a healthy industry is marked by expanding consumer market. Photographs, table. (A4, Mg)

141-A. Gold in 1955. Robert W. Bachelor. *Mining Congress Journal,* v. 42, Feb. 1956, p. 144-146.

Based on monthly report, gold production of the world is estimated to have set a new post-war record of more than $950,000,000 in value. Photographs. (A4, Au)

142-A. Light Metals in 1955. Kim Darby. *Modern Metals,* v. 12, Feb. 1956, p. 62-66.

Review of aluminum, magnesium and titanium industries in 1955. (A4, Al, Mg, Ti)

143-A. Dollars Down the Drain. George E. Barnes. *Steel,* v. 138, Feb. 6, 1956, p. 136-138, 140, 142.

An analysis of industry's waste disposal problem and proposals concerning waste control. Photograph, tables, graph. (A8)

144-A. Prosperity and Profits in the Drop Forging Industry. Gordon R. Walker. *Steel Processing,* v. 42, Feb. 1956, p. 79-82.

Sources of profits and advantages to the company. Recent net sales and profits compared with other industries. Graphs. (A4, F22)

145-A. (Book.) **Vocational and Professional Monographs. No. 33. Metallurgy.** Alvin S. Cohan. 20 p. 1955. Bellman Publishing Co., Cambridge 38, Mass.

An attempt to give some indication of the over-all aspects of the interesting and rewarding branch of metallurgical engineering. 14 ref. (A3, A6)

146-A. (Book.) **Proceedings of the 1954 Cryogenic Engineering Conference.** William B. Hanson, Compiler. NBS Report 3517. 278 p. 1955. National Bureau of Standards, Washington 25, D. C.

Summaries of 57 technical papers dealing with equipment, instrumentation, applications, insulation, properties of materials, special equipment and processes. Papers of interest to metallurgists are abstracted separately. (A general)

B

Raw Materials and Ore Preparation

41-B. Surface Tensions of Silicates. R. E. Boni and G. Derge. *Journal of Metals,* v. 8; *American Institute of Mining Engineers, Transactions,* v. 206, Jan. 1956, p. 53-59.

Review literature dealing with surface tension of molten silicates with compositions of metallurgical interest. Discusses liquid surface tension, methods of measurement, slag constitution, relations to operating problems. Tables, graph. 41 ref. (B21, P10)

42-B. Adsorption of Ethyl Xanthate on Pyrite. A. M. Gaudin, P. L. de Bruyn and Olav Mellgren. *Mining Engineering,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 205, Jan. 1956, p. 65-70.

Radio-analysis used to determine effect of pyrite preparation, pH, and oxygen, hydroxyl, hydrosulfide, sulfide and cyanide ions on xanthate adsorption. Graphs, tables. 22 ref. (B14, Fe)

43-B. (Russian.) **Methods of Determining Viscosity of Blast Furnace Slags and Rocks.** D. A. Cherkov. *Zavodskaia laboratoriia,* v. 21, no. 12, 1955, p. 1461-1463.

Description of muffle furnace, thermocouples and other equipment. Experimental methods. Table. 1 ref. (B21, D1)

44-B. (Russian.) **Use of Electron Microscope for the Study of Porous Refractory Materials.** V. V. Pustovalov. *Zavodskaia laboratoriia,* v. 21, no. 12, 1955, p. 1483-1485.

Clay and alumina refractories were studied after polishing. Shape and size of pores determine slag and gas-resistance. Diagrams, micrographs. (B19)

45-B. (Russian.) **Study of Process of Oxidation of Sulfides and Sulfide Ores.** M. E. Pozin, A. M. Ginstling and V. V. Pechkovskii. *Zhurnal prikladnoi khimii,* v. 28, no. 12, Dec. 1955, p. 1249-1254.

Oxidation of sulfides of zinc, iron and cadmium in air streams at various temperatures. Relations between intensity of oxidation, temperature and compositions. Graphs, tables. 12 ref. (B14, Zn, Fe, Cd)

46-B. (Slovak.) **Production of Ferrochromium and Its Importance.** Juraj Holan. *Hutnik,* v. 5, no. 8, Aug. 1955, p. 237-241.

Description and analysis of various types according to the All-Union State Standards (GOST) and power consumption. State of production in the Soviet Union, Czechoslovakia and the West. Tables, diagrams. 7 ref. (B22, D general, A4, Fe-n)

47-B. A Study of Contact Times in Pilot Plant Agitators, Using Radioactive Tracers. J. C. Turgeon. *Canadian Mining and Metallurgical Bulletin,* v. 49, no. 525, Jan. 1956, p. 16-20; *Canadian Institute of Mining and Metallurgy, Transactions,* v. 59, 1956, p. 16-18.

Study of the flow process in leaching tanks aimed at increasing efficiency of leaching process. Europium 152-154 was used as the tracer. Photograph, diagram, graphs, tables. (B14, S19, U)

48-B. (German.) **Filter Process for Deoxidation of Oxygenated Molten Copper.** F. Erdmann-Jesnitzer and W. Wichmann. *Metall,* v. 10, nos. 1-2, Jan. 1956, p. 2-8.

Use of magnesite sieves and charcoal lump for the production of high-ductility copper. Graphs, diagram, micrographs, photographs. 15 ref. (B22, B14, Cu)

49-B. (Italian.) **Considerations on the Behavior of Refractory Materials Against Thermal Stresses.** L. Massimilla and S. Bracale. *Metallurgia Italiana,* v. 47, no. 11, Nov. 1955, p. 511-518.

Influence of modulus of elasticity, thermal diffusivity, thermal expansion and mechanical strength, and a "homogeneity" factor. (B19)

50-B. (Russian.) **Methods of Improving Cupola Coke.** L. S. Dreizin. *Liteinoe proizvodstvo,* 1955, no. 12, Dec., p. 6-9.

Ash content, density, porosity and composition of coke, coking rate, coarseness of pulverized anthracite, final temperature, other conditions. Tables. (B22)

51-B. Fluidized Roasting of Pyrite. R. B. Thompson and B. H. McLeod. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb, 17 p.

Practical aspects and microscopic studies. Application of technique to oxidation of pyrite for the production of sulfur dioxide gas. Diagrams, tables. (B15)

52-B. The Gyratory Ball Mill. A. W. Fahrenwald. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956. Feb., 9 p.

Description of mill, its operation, applications. Tables, diagram. (B13)

53-B. Improved Contact Angle Apparatus for Flotation Research. Donald W. McGlashan and Kenneth N. McLeod. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 14 p.

Contact angle apparatus using free bubbles with precise temperature control and continuous pH measurement and recording. Photographs, diagrams, graphs, table. 12 ref. (B14)

54-B. Interpretation of Ore Test Data. D. E. Newton and H. J. Gisler. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 11 p. + 4 plates.

Three examples of interpretation of laboratory concentration and other tests. Diagrams, tables. (B14, Cu)

55-B. A Micrographic Study of Sulphide Roasting. P. G. Thornhill and L. M. Pidgeon. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 17 p.

Particles were separately isothermally roasted in an air-swept system. Progress was followed by examination in polished section and by X-ray and chemical analysis of residual sulfide kernels. Tables. 15 ref. (B15, Fe, Cu)

56-B. Reagent Control in Flotation. C. H. G. Bushell and M. Malnarich. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 12 p. + 5 plates.

Method for analyzing flotation solutions for xanthate. Tests show high correlation between separation efficiency and pH and xanthate concentration. Possibility of automatically controlling reagent additions. Graphs. (B14, S11, Fe, Pb, Zn)

57-B. Tuning a Humphreys Spiral Concentrator Plant For Efficient Operation. Henry D. Snedden. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 4 p.

Outline of a plant tune-up program. Description of spiral installation and its loading, adjustment and operation. Tables, diagrams, graphs. (B14)

58-B. The Mechanism of Bursting Expansion in Chrome-Magnesite Bricks. G. R. Rigby. *British Ceramic Society, Transactions,* v. 55, Jan. 1956, p. 22-24; disc., p. 34-35.

The mechanism of bursting expansion that occurs when refractory materials containing chromium ore absorb iron oxide is considered to have its origin in unequal diffusion that occurs in the solid state. Laboratory experiments have shown that when one face of a pellet of mag-

netite is held against the face of a magnesiochromite pellet at 1350° C., unequal diffusion takes place, iron ions from the magnetite diffusing more rapidly into the magnesiochromite than chromium ions from the magnesiochromite into the magnetite. Graphs, photograph, table. 20 ref. (B19, Ni, Fe)

59-B. Development of the Port Radium Leaching Process for Recovery of Uranium. *Canada, Department of Mines and Technical Surveys, Mines Branch Technical Paper No.* 13, 1955, 22 p.

Process is based on extraction of uranium by treatment of the ore with weak unheated sulphuric acid solutions in the presence of an oxidizing agent. Diagram, tables, graph. (B14, U)

60-B. The Flotation of Radioactive Minerals. T. V. Lord and D. E. Light. *Canadian Mining and Metallurgical Bulletin,* v. 49, no. 526, Feb. 1956, p. 91-95.

Minerals containing uranium have been successfully preconcentrated by flotation. Uraninite, uranothorite, euxenite and fergusonite have responded to flotation to yield grades of 0.2 to 6.0% uranium oxide with recoveries of 85 to 98% from heads analyzing approximately 0.10% uraium oxide. Tables. 4 ref. (B14, U)

61-B. The Place of the Rod Mill in the Grinding Circuit. B. G. MacDermid. *Canadian Mining and Metallurgical Bulletin,* v. 49, no. 526, Feb. 1956, p. 96-105.

Opinions on the field of size reduction which should be allotted to rod mills in the design of crushing and grinding circuits. Tables, diagram. 12 ref. (B13)

62-B. Technical Advances During 1955. II. Milling and Process Metallurgy. L. E. Djingheuzian. *Canadian Mining Journal,* v. 77, Feb. 1956, p. 119-122.

The cumulative effect of some of the most important milling and process metallurgy developments and events in 1955. Photographs, table. 5 ref. (B13, B14)

63-B. New Moves on the Lithium Chessboard. *Chemical Week,* v. 78, Feb. 11, 1956, p. 60, 62.

A chlorine volatilization process for recovery of lithium from pegmatite ore. Diagram. (B14, Li)

64-B. Ore Dressing. James W. Franklin. *Engineering and Mining Journal,* v. 157, Feb. 1956, p. 133-136.

1955 was highlighted by developments in uranium, the success of synthetic flocculants, a throw-away table deck, a successful year for one autogenous grinding unit, and a great amount of new mill construction and planning. Lists new mills and patents. Photographs, tables. (B13, B14, U, Al)

65-B. Iron Ore Beneficiation. Fred D. DeVaney. *Engineering and Mining Journal,* v. 157, Feb. 1956, p. 141-143.

Survey of 1955 developments. Photographs. (B14, Fe)

66-B. Kinetic Study of the Oxidation of Sphalerite. John N. Ong, Jr., Milton E. Wadsworth and W. Martin Fassell, Jr. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb, 1956, p. 257-263.

Temperature and oxygen concentration dependence on the reaction of sphalerite in oxygen at pressures from 6 to 640 mm. mercury was investigated in the range 700-870° C. Conditions for a sulfatizing or oxidizing roast proposed. Graphs, tables, diagrams. 20 ref. (B15, Zn)

67-B. Geology in Mining. J. D. Forrester. *Mining Congress Journal,* v. 42, Feb. 1956, p. 100-104, 112.

Basic geologic methods with trends to diversification, application of specialized techniques, continuation of uranium search characterize a year of commendable progress by mining geologists. Photographs. (B12, U)

68-B. Mineral Dressing in 1955. T. M. Morris. *Mining Congress Journal,* v. 42, Feb. 1956, p. 113-115.

Intensified research in beneficiation techniques was the most important development in ore concentration. Photographs. (B14)

C
Nonferrous Extraction and Refining

78-C. The Electrochemistry of Aluminum Production. E. A. Hollingshead and N. W. F. Phillips. *Chemistry in Canada,* v. 8, Jan. 1956, p. 37-40.

Constitution and physical properties of the electrolyte, reactions occurring at the electrodes. Graphs, tables, photograph, diagram. 18 ref. (C23, Al)

79-C. Molten Cyanide Process of Purifying Germanium From Copper Contamination. Pei Wang. *Journal of Physical Chemistry,* v. 60, Jan. 1956, p. 45-47.

Treatment with molten alkali cyanide at elevated temperatures will remove copper contamination, with no thermal conversion or resistivity change evident in the germanium. Tables. 14 ref. (C24, Cu, Ge)

80-C. Principles of Vacuum Distillation of Metal Mixtures. J. E. Vivian. *Livermore Research Laboratory (U. S. Atomic Energy Commission),* LRL-88, Mar. 1954, 30 p.

Critical review of principles as applied to the separation of mixtures of metal. Limitations of the usual simplified equilibrium and rate relations for the batch process; relations of more general applications. Diagrams, graphs, table. (C22)

81-C. The Electrolytic Migration of Uranium From Acid Leach Liquors by Means of Ion Exchange Membranes. Norman W. Frisch. *Rohm and Haas Company Research Laboratories (U. S. Atomic Energy Commission),* RMO-2526, Aug. 3, 1953, 10 p.

Studies were conducted in a three-compartment cell, using anion permeable membranes; effect of certain operational variables on the economics of uranium recovery were noted. Diagrams, graphs, table. (C23, U)

82-C. Electrolytic Recovery of Manganese From Barren Leach Liquors. Paul F. Kirk. *Rohm and Haas Company Research Laboratories (U. S. Atomic Energy Commission),* RMO-2508, Aug. 22, 1952, 9 p.

The method, employing permselective, ion exchange membranes, gives a high-grade manganese product at excellent recovery levels. Diagram, tables. (C23, Mn)

83-C. Further Studies on the Recovery of Uranium From Sulfuric Acid Leach Solutions by Anion Exchange Resins. Al Preuss, Charles Dickert and Jean Saunders. *Rohm and Haas Company Research Laboratories (U. S. Atomic Energy Commission),* RMO-2527, Dec. 1953, 25 p.

Deals with a screening of resins employing tertiary, mixed tertiary-quaternary, and quaternary groupings incorporated into the resin structure. Graphs, tables. (C23, U)

84-C. (French.) **Aluminum in Australia.** G. A. Baudart. *Revue de l'aluminium,* v. 32, no. 226, Nov. 1955, p. 999-1001.

Facilities of the Bell Boy (Tasmania) reduction plant of 13,000 tons per year capacity. Maps. (C23, Al)

85-C. The Melting of Reactive Metals. J. Ian Nish. *Australasian Engineer,* 1955, Dec., p. 68-73.

Difficulties involved, methods used, or proposed for use. Diagrams, photographs. 25 ref. (C21)

86-C. Effect of Zone-Refining Variables on the Segregation of Impurities in Indium-Antimonide. T. C. Harman. *Electrochemical Society, Journal,* v. 103, Feb. 1956, p. 128-132.

Problems involved in preparation of high-purity indium antimonide. Electrorefining effectively removes zinc from indium; zone-refining effectively removes tellurium. Graphs. 3 ref. (C5, C23, In, Sb, Te, Zn)

87-C. Chemical Processing of Irradiated Fuel From Nuclear Power Reactors. F. Roberts. *Industrial Chemist and Chemical Manufacturer,* v. 32, Jan. 1956, p. 15-23.

Part played in nuclear power program by the chemical separation plants. The merits of various processing schemes, both present and contemplated, discussed in detail. Photographs, diagrams, tables, graph. 41 ref. (C general, U)

88-C. Pyroprocessing for Nuclear Fuels. Robert C. Reid, Dick Duffey and J. Edward Vivian. *Nucleonics,* v. 14, Feb. 1956, p. 22-25.

Engineering problems envisioned for pyroprocessing. Example of such a separation system described. Diagram. 16 ref. (C21, U)

89-C. (Czech.) **Reduction Melting of Tin Concentrates.** Ferdinand Kadlec. *Hutnické listy,* v. 10, no. 12, Dec. 1955, p. 706-709.

A concentrate of 56% tin, 10% iron was smelted with charcoal. Optimum charcoal additions, chimney and slag losses determined. Tables, graph. 2 ref. (C21, Sn)

90-C. (French.) **Electric Arc Melting of Molybdenum Alloys Under Vacuum.** M. P. Gousseland. *Métaux, corrosion-industries,* v. 30, no. 363, Nov. 1955, p. 415-425.

Melting and working of molybdenum alloys, physical properties of molybdenum and the 0.5% titanium molybdenum alloy, high-temperature properties, protection against oxidation. Photographs, tables, graphs. (C23, P general, Q general, Mo, Ti)

91-C. (German.) **Smelting and Casting of Titanium.** Werner Scheibe. *Giesserei,* v. 43, no. 1, Jan. 5, 1956, p. 8-17.

Historical development of titanium smelting, mechanical and physical properties of titanium, production of titanium sponge by Kroll method, contemporary distilling and smelting processes. Tables, graphs, diagrams, photographs. 280 ref. (C general, P general, Q general, Ti)

92-C. (German.) **Induction Smelting.** Karl-Heinz Brokmeier. *Giesserei,* v. 43, no. 3, Feb. 2, 1956, p. 57-64.

Electrical fundamentals and their significance for the selection of furnace type. Application of induction furnaces for treatment of different metals. Photographs, diagrams, graphs, table. (C21)

93-C. (Italian.) **Low-Frequency Induction Furnaces in the Electrification of the Foundry.** P. I. Elio Calamari. *Fonderia,* v. 250, no. 12, Dec. 1955, p. 557-566.

Description of modern induction furnaces, advantages of electricity, use of large-capacity furnaces for

the production of bronze, brass, copper and aluminum. Diagrams, photographs, tables. 12 ref. (C21, Al, Cu)

94-C. Complex Metallurgy by Cerro de Pasco. I. L. Barker. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 12 p.

Summary of a Peruvian metallurgical company's operations, with emphasis on smelting and refining. Photographs, tables. 6 ref. (C21, Pb, Cu, Zn, Bi, Ag, Au)

95-C. Increasing the Capacity of a Small Copper Smelter. Edward J. Caldwell. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 11 p.

Detailed account of smelting plant's development since 1924. Diagrams, table. (C21, Cu)

96-C. Some Notes on Oroya Copper Slags. I. L. Barker, J. S. Jacobi and B. H. Wadia. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 13 p. + 12 plates.

Preliminary report covering investigations into copper slag composition and losses. Micrographs, graphs, tables. 4 ref. (C21, Cu)

97-C. Survey of Mechanical Charging Practices of Horizontal Retort Zinc Smelters. J. Wesley Burgess. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 15 p.

Four different types of charging machines described. (C21, Zn)

98-C. Some Theoretical Factors in the Zone Melting Process. Richard J. Dunworth. *Argonne National Laboratory (U. S. Atomic Energy Commission).* ANL-5360, Feb. 1956, 38 p.

Purification of an alloy by zone melting depends on the difference in solute concentration between the liquid phase and the solid phase, the diffusion rates of the solute in the solid and liquid phases, the degree of thermal or magnetic stirring in the liquid zone, the irregularity of the solidifying interface and a concentration gradient in the liquid near the interface. Tables, diagrams, graphs. 43 ref. (C5)

99-C. The Mufulira Electrolytic Copper Refinery. G. E. Rowe, G. N. Healey, P. C. Lockyer and A. A. Haynes. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 28 p.

Anode production in the smelter. Design, equipment and operating techniques of the refinery tankhouse. Tables, (C21, C23, Cu)

100-C. Extractive Metallurgy. A. W. Schlechten. *Engineering and Mining Journal,* v. 157, Feb. 1956, p. 137-140.

Review and forecast of progress in extraction of nonferrous metals. Diagram, photograph. (C general, Ti, Zr, Pb, U, Zn, Ni, Al, Cu, Ge)

101-C. Reduction of Tungsten Oxides With Hydrogen. Joel O. Hougen, Robert R. Reeves and Gene G. Mannella. *Industrial and Engineering Chemistry,* v. 48, Feb. 1956, p. 318-320.

Effect of pellet size, flow rate and temperature on the rate of reduction of finely divided tungsten trioxide and tungsten dioxide in pelletized form with hydrogen from 500 to 800° C. Tables, graphs. 4 ref. (C2, W)

102-C. Floating Zone Melting of Solids by Electron Bombardment. M. Davis, A. Calverley and R. F. Lever. *Journal of Applied Physics,* v. 27, Feb. 1956, p. 195-196.

Electron bombardment is a means of obtaining stable floating zones. This step offers advantages in simplicity of operation and also permits the method to be easily extended to many refractory materials. Diagram, photograph. 5 ref. (C5, N12)

103-C. The Mufulira Electrolytic Copper Refinery. R. H. Bauld, G. E. Rowe, G. N. Healey, A. A. Haynes and P. C. Lockyer. *Journal of Metals,* v. 8, Feb. 1956, p. 234-256.

Design, construction and operation of the anode department and of the refinery tankhouse. Diagrams, photographs, tables. (C23, Cu)

104-C. Preparation of Metallic Titanium by Film Boiling. A. W. Petersen and L. A. Bromley. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 284-286.

Titanium, of 99.9% purity, was produced by film boiling titanium-iodide liquid on a heated filament. Diagrams, photographs. 16 ref. (C4, Ti)

105-C. (French.) **Zirconium, a Nuclear Material.** Thien-Chi Nguyen. *Vide,* v. 10, no. 60, Nov.-Dec. 1955, p. 152-164.

Special method of preparing ductile, high-purity zirconium, by the dissociation of ZrI_4 in contact with an incandescent wire, in a previously evacuated container. Tables, diagrams, photographs, graph. (C4, Zr)

106-C. (German.) **Effect of Antimony on Oxidation of Liquid Lead.** Erich Pelzel. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 9, no. 1, Jan. 1956, p. 17-25.

Effect of 0.5 to 5.0 grams of antimony per ton of lead on formation of oxide on the surface of molten metal in the ladle. Graphs, diagrams, tables, micrograph. 20 ref. (C5, Pb, Sb)

107-C. (Polish.) **Technology of Production of Metallic Lithium Under Reduced Pressure.** T. Szarowicz and M. Orman. *Prace Instytutow Ministerstwa Hutnictwa,* v. 7, nos. 5-6, Dec. 1955, p. 270-275.

The aluminothermic reduction is applied to lithium, with an efficiency of 89%. Vacuum techniques also explored. Tables, graphs, diagrams, photographs. 13 ref. (C26, C25, Li)

D

Ferrous Reduction and Refining

95-D. (Czech.) **Economics of Various Heat Installations.** Frantisek Vanis. *Hutnik,* v. 5, no. 8, Aug. 1955, p. 226-232.

Czech steel mills compared for consumption of heat in production of raw steel. Effect of different fuels. Blast furnace and openhearth heat consumption data. Economizing measures and automatic regulation. Rolling-mill heat consumption. Tables, graphs. 7 ref. (D1, D2, F23, ST, Fe)

96-D. (Czech.) **Composition and Calculation of Charge for 200-Ton Openhearth Furnace for Required Carbon Content in Molten Steel.** Jaroslav Becvar. *Hutnik,* v. 5, no. 8, Aug. 1955, p. 232-234.

Calculation of various components, raw iron, ore, scrap, lime, manganese and procedure in melting charge to attain desired quality of steel. Table. 4 ref. (D2, CI)

97-D. (German.) **Electric Hot-Topping of Forging Grade Steel Ingots.** Erik Johansson and Elis Helin. *Stahl und Eisen,* v. 75, no. 26, Dec. 29, 1955, p. 1755-1765.

History of hot-topping in Sweden. Application of the electric hot-topping device and experiments on 1000 tons of forging grade steel. Tables, graph, diagrams, photographs, oscillograms. (D9, ST)

98-D. Chromium Reactions in Acid and Basic Furnaces. Sam F. Carter. *American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Preprint,* 1955, 13 p.

Correlation of slag and bath compositions of two to three-ton heats in electric furnaces for production of high-chromium steel castings. Studies of chromium losses. Tables, graphs. 5 ref. (D5, AY)

99-D. Hydrogen Control Through Flushing of Molten Steel in Electric-Arc Furnaces. L. F. Barnhardt. *American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Preprint,* 1955, 2 p.

Procedures for using dry nitrogen, argon or dry air to remove hydrogen from a gas-sensitive steel. (D5, ST)

100-D. Electric Control of Open Hearths. A. K. Bayles and D. H. Stanton. *Instruments and Automation,* v. 29, Jan. 1956, p. 86-90.

Instruments for control of furnace pressure, roof temperature, the fuel-air, oil-steam and oil-gas ratios, BTU input, furnace reversal. Diagrams, photographs. (D2, ST)

101-D. Increased Steel Production From Desiliconized Hot Metal. E. C. Wright. *Iron and Steel Engineer,* v. 33, Jan. 1956, p. 73-85; disc., p. 84-85.

Indicates that the use of a wash metal can increase production capacity at least 25% for present openhearth installation. Analysis also shows that a desiliconized wash metal with a 2% carbon, 0.2% manganese and 0.1% silicon can practically double electric furnace output and decrease power and electrode costs by 40 to 50%. Both practices are primarily applicable at integrated steel plants where ample hot metal is available. Tables, graphs. 7 ref. (D2, D5, ST)

102-D. Silicon and Manganese Reactions in Ferromanganese Blast-Furnace Processes. E. T. Turkdogan. *Iron and Steel Institute, Journal,* v. 182, Jan. 1956, p. 74-79.

An attempt has been made to discover the factors controlling the distribution of manganese and silicon between manganese metals and slags. By making use of some laboratory experimental results, it has been possible to calculate the activity coefficient of manganous oxide in blast furnace-type slags. Graphs, tables. 9 ref. (D1, P12, Fe)

103-D. Dephosphorization of Alloys by Hydrogen. P. C. Ghosh and B. Chatterjee. *Iron and Steel Institute, Journal,* v. 182, Feb. 1956, p. 153-155.

The loss of phosphorus, on heating powdered samples of phosphor-copper, ferrophosphorus and a cast iron in hydrogen and nitrogen, both dry and wet, determined. Tables. 3 ref. (D general, C general, Cu, CI)

104-D. Automatic Stock-Level Control on Blast-Furnaces. I. Kjellman and K. Krönblad. *Iron and Steel Institute, Journal,* v. 182, Feb. 1956, p. 168-170.

Details of a new automatic stock-level controller and the favorable results obtained. Diagrams. 5 ref. (D1)

105-D. (German.) **Practical Application of the Process of Degasifying Steel Under Vacuum, Particularly for Large Forging Grade Steel Ingots.** Arthur Tix. *Stahl und Eisen,* v. 76, no. 2, Jan. 26, 1956, p. 61-68.

Describes plant and pump for casting ingots, in order to avoid occurrence of flakes and nonmetallic inclusions, and to eliminate expensive heat treatment necessary to remove hydrogen by diffusion. Effect on properties. Photographs, micrographs, diagrams, graphs, tables. 16 ref. (D8, ST)

106-D. (Polish.) **Good and Bad Maintenance of the Tap Hole.** Wladyslaw Hansel and Waclaw Dakowicz. *Wiadomosci hutnicze,* v. 11, no. 12, Dec. 1955, p. 374-378.

Proper and improper opening of the openhearth furnace tap hole. Design of hole and threshold, type, use of block. Diagrams. (D2, CI)

107-D. (Polish.) **Practical Possibilities of Rapid Heating in Openhearth Silica Roofs.** Stanislaw Pawlowski. *Wiadomosci hutnicze,* v. 11, no. 12, Dec. 1955, p. 378-380.

Defects of heating methods in use in Poland and elsewhere. New designs to heat roof or crown utilize compressed air, save on gas, and cut down time. Diagram. 1 ref. (D2)

108-D. (Russian.) **Influence of Vacuum Melting on Growth Of Cast Iron.** F. N. Tavadze and I. A. Bairamashvili. *Liteinoe proizvodstvo,* 1955, no. 12, Dec., p. 23.

Effect of dissolved gases, comparison of linear growth and weight increase of original cast iron and cast iron remelted and degasified in vacuum furnace. Nature of graphitic inclusions in both cases. Tables, micrographs, graph. 1 ref. (D8, CI)

109-D. Mothballing a Blast Furnace. F. R. Kik. *Blast Furnace and Steel Plant,* v. 44, Feb. 1956, p. 208-210, 212, 214.

Vinyl plastics were used experimentally to seal blast furnace during indefinite banking. Photographs. (D1, ST)

110-D. Automatic Control in the Steel Industry. B. O. Smith. *Institution of Chemical Engineers, Transactions,* v. 33, no. 3, 1955, p. 195-198.

Operating variables for the openhearth furnace and the mill reheating furnace. Automatic control of rolling mills is imminent. Diagrams. 4 ref. (D2, F23, S18, ST)

111-D. Production of High Nitrogen Steels. V. F. Zackay, E. R. Morgan and J. C. Shyne. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 216.

Properties and methods of manufacturing high nitrogen steels. Tables. 2 ref. (D8, D9, AY)

112-D. Oxygen Sampler Guards Open-Hearth Efficiency. *Steel,* v. 138, Feb. 20, 1956, p. 116, 119.

System for reliable measurement of oxygen content in openhearth flue gases obtains a continuous dirt-free sample with a minimum of maintenance. Fuel-air ratio is automatically adjusted for optimum combustion efficiency. Diagrams, photograph. (D2, S11)

113-D. (Czech.) **Effect of Gas on the Quality of Pig Iron and Cast Iron.** Vladimir Zednik and Miroslav Sicha. *Slévarenstvi,* v. 4, no. 1; *Prace Ceskoslovenského vyzkumu slévarenskeho,* v. 3, no. 27, Jan. 1956, p. 181-196.

Cause of a higher content of gases in old gray cast iron is attributed to the rapid acceptance of moisture by graphite. The critical content of hydrogen in cast iron, gas enriched with water vapor, is 5 to 10 cc. of hydrogen per 100 g. of metal. The gas content in the pig iron depends only slightly on the type and composition of the blast furnace charge. Tables, micrographs, graph, diagram. 16 ref. (D1, CI)

E Foundry

199-E. Glass Cast Molds for Precision Casting of High Temperature Alloys. *Industrial Heating,* v. 23, Jan. 1956, p. 140 + 5 pages.

Procedures and equipment necessary for Glascast process. Method is quick and economical, meeting high precision standards. Photographs. (E16)

200-E. Shell Molding Advances Foundry Automation. James Sutherland. *Tool Engineer,* v. 36, Feb. 1956, p. 209-210.

Outline of the automatic shell molding process and its advantages. Photographs, diagram. (E16, A5)

201-E. Zircon Sands Give Smoother Steel Casting Surface. Hubert Chappie. *Western Metals,* v. 14, Jan. 1956, p. 68, 71.

Advantages are high conductivity, high melting point of 4000 or 3400° F., with binders, low expansion, excellent chilling properties, chemical stability, ease of removal from castings during shakeout and fineness. Cost is minimized and best results obtained by using it sparingly. Photographs. (E18, CI)

202-E. Magnesium Plaster Castings. E. J. Willis. Paper from "The User Speaks About Magnesium". Magnesium Association, 6 p.

Plaster molds are being used where normal sand castings were inadequate or impossible. Some points on the use of plaster are clarified, which lead to a better understanding of the problems in the production of castings and the usefulness of the plaster process to the ultimate user. Photographs, diagrams. (E16, Mg)

203-E. More Bark Than Bite. Sherwood H. Egbert. Paper from "The User Speaks About Magnesium". Magnesium Association, 17 p. + 7 plates.

Problems and their solution involved in the production of magnesium die castings and their subsequent processing into finished parts. Photographs. (E13, Mg)

204-E. (Czech.) **Melting and the Effect of Melting and Casting Conditions on the Mechanical Values of Tin Bronzes.** Josef Krumpos. *Slévarenstvi,* v. 3, no. 12, Dec. 1955, p. 373-380.

Melting and deoxidation of tin bronze and red brass, casting of test specimens, mechanical properties. Tables, graphs, diagrams, micrographs. 7 ref. (E25, Q general, Cu)

205-E. (Czech.) **Testing of Molding Materials. II. Wear Testing of Cores. Auxiliary Equipment.** Ladislav Jenicek. *Slévarenstvi,* v. 3, no. 12, Dec. 1955, p. 380-385.

Wear test is described and no relation between wear and bending resistance was evidenced. Other variables are evaluated. (E21)

206-E. (Czech.) **Possibilities of Pouring in Permanent Molds in Gray and Malleable Cast Iron Foundries.** Fritz Naumann. *Slévarenstvi,* v. 3, no. 12, Dec. 1955, p. 385-387.

Materials and design considerations. Procedures for production of gray iron castings by pouring into open permanent and semipermanent molds and closed permanent molds. (E12, CI)

207-E. (Czech.) **Measure of Blast Volume in the Cupola.** Zdenek Gause. *Slévarenstvi,* v. 3, no. 12, Dec. 1955, p. 388-391.

Equations for measuring blast flow. Data for use of the Prandtl tube. Work is undertaken to reduce waste casting. (E10)

208-E. (Czech.) **New Core Binders Utilizing Synthetic Resins.** Jiri Ornst. *Slévarenstvi,* v. 3, no. 12; *Prace Ceskoslovenského vyzkumu slévarenského,* v. 2, no. 26, Dec. 1955, p. 175-180.

A new binder, VUMT 71, based on a phenol resin, utilizes the emulsion effects of sulfite lye and the chemical reactivity of lignin. One hour bake is usually adequate, but overbaking is tolerated. (E18, E21)

209-E. (German.) **The Basic Hot-Blast Cupola Furnace as a Premelting Unit in the Openhearth Steel Plant.** Wilhelm Schüll and Georg Rockrohr. *Stahl und Eisen,* v. 76, no. 1, Jan. 12, 1956, p. 1-12; disc., p. 12-13.

Description of plant, method of operation, problems of materials to be charged, composition and preliminary treatment of premelted iron, production and economic factors. Photographs, diagrams, graphs, tables. 15 ref. (E10, D2, ST)

210-E. Design Considerations for Magnesium Plaster-Mold Castings. E. J. Willis. *Machine Design,* v. 28, Feb. 9, 1956, p. 131-132.

Improved design can mean better tolerances and smoother surface conditions, along with cost reduction, by elimination of machining in finishing. Photographs, diagrams. (E16, Mg)

211-E. Sand Mould Penetration Testing. I. A Simple Laboratory Apparatus for Estimating the Resistance of Sand Moulds to Penetration by Molten Metal. D. H. Houseman, D. V. Atterton and T. P. Hoar. *Metallurgia,* v. 53, no. 315, Jan. 1956, p. 21-25.

Apparatus whereby a sample may be removed from the face of a sand mold or standard compact and tested for its resistance to penetration by mercury at room temperature. Diagram, photograph, graphs, tables. 3 ref. (E18, E19)

212-E. Vibration During Casting of Gas Turbine Blades. (Digest of "The Application of Sub-Sonic Vibrations During Solidification of Castings, With Particular Reference to a Material for Gas Turbine Blades—'H. R. Crown Max'", by S. Hinchliff and Josiah W. Jones, College of Aeronautics, Report No. 89, Apr. 1955, 42 p.) *Metal Progress,* v. 69, Feb. 1956, p. 134, 136, 138.

Significant improvements in mechanical properties obtained by vibration during solidification of a 23% chromium, 12% nickel, 3% tungsten alloy. Table. (E11, SS)

213-E. Stainless Steel—Investment Cast. E. L. White, Jr. *Precision Metal Molding,* v. 14, Feb. 1956, p. 42-43, 82.

Tables of chemical composition and mechanical characteristics of several investment cast stainless steels of the austenitic and martensitic types. Tables, photograph. (E15, Q general, SS)

214-E. Insulated Risers for Permanent Mold Casting. D. Peckner. *Precision Metal Molding,* v. 14, Feb. 1956, p. 57-58, 95-96.

Insulated riser sleeves are used to slow down rate of heat transfer between cast alloy and metal molds. Photographs. (E22, E12)

215-E. (French.) **The Behavior of Refractory Alloy Cast Pieces for Jet Engines. (oLst Wax Process).** W. Sulzer and F. Eisermann. *Métaux, corrosion-industries,* v. 30, no. 363, Nov. 1955, p. 440-446.

Thermal shock tests with refractory materials, cast by the lost wax process, show that blades cast for

jet engines behave as well as forged pieces. Tests and results with several alloys at different temperatures examined. Diagrams, tables, photographs. (E15, Q general, T24, EG-d)

216-E. (Italian.) **Principal Addition Elements in Cast Iron and Steel.** *Fonderia,* v. 250, no. 12, Dec. 1955, p. 573-576.

Principal and secondary constituents of cast iron and steel, their influence and use. Use of aluminum, arsenic, nitrogen and beryllium as corrective elements for improving quality of cast iron and steel. (To be continued.) (E25, B22, CI)

217-E. (Russian.) **Experience in the Use of the Chemical Method for Hardening Foundry Cores.** I. B. Semenchenko. *Liteinoe proizvodstvo,* no. 12, Dec. 1955, p. 1-12.

Composition of mixture and type of sand, special design of core boxes to control carbon dioxide and liquid glass. This method is especially suitable for casting alloy steel parts in small-scale practice. Table, photographs. (E21, CI)

218-E. (Russian.) **High-Strength Pattern Compositions for Precision Casting.** P. V. Sorokin and E. K. Alekseevskaia. *Liteinoe proizvodstvo,* no. 12 Dec. 1955, p. 2-4.

Polyethylene and its properties. Use and evaluation of paraffin or ceresin wax and their blends or fusions with polyethylene. Graphs, tables. 6 ref. (E15, E17)

219-E. (Russian.) **Improving the Design and Construction of Compression Molds for Pressure Die Casting.** V. I. Vagin. *Liteinoe proizvodstvo,* no. 12, Dec. 1955, p. 13-15.

Automatic arrangements for removing various mold and core sections. Diagrams. (E13)

220-E. (Russian.) **Importance of Forehearth in Cupola Melting.** V. A. Fuklev. *Liteinoe proizvodstvo,* no. 12, Dec. 1955, p. 17-18.

Proper use of this reservoir in maintaining surge capacity. Charge make-up and charging practice. Melting phenomena. Diagrams. (E10, CI)

221-E. (Russian.) **Effect of Nonmetallic Inclusions on Formation of Gaseous Porosity.** D. P. Lovtsov. *Liteinoe proizvodstvo,* no. 12, Dec. 1955, p. 18-20.

Such inclusions increase viscosity of melt, change surface tension and character of crystallization of metals, seriously lower mechanical properties, act as centers of gas-bubble formation and have a decisive effect on absorption of gases by metals. Photographs, table. 8 ref. (E25, Al)

222-E. (Russian.) **Gas Content of Magnesium Cast Iron.** V. I. Lakomskii and V. I. Iavoiskii. *Liteinoe proizvodstvo,* no. 12, Dec. 1955, p. 20-22.

Composition and amount of gas in various types of cast iron. Methods of controlling gas-formation so as to improve structure and properties of cast iron. Modification process in cast iron. Tables, graphs, photograph. 16 ref. (E25, CI, Mg)

223-E. (Russian.) **Use of Easily Removable Foundry Heads on a Massive Steel Casting.** I. E. Blokhin, E. T. Dolbenki, V. I. Emel'ianov and V. A. Pershin. *Liteinoe proizvodstvo,* no. 12, Dec. 1955, p. 24-25.

Advantages of this design and method over set-up with foundry head removed by machine or fire-cutting. Use of separating plates with feeder openings and frame rods. Diagrams, graph, table. (E22, CI)

224-E. **Pressure Die Casting of Shock Absorber Components.** *Machinery (London),* v. 88, Feb. 3, 1956, p. 217-225.

Control equipment, die casting machines and their adaptations, castings and dies, casting with tubular insert, fettling methods. Photographs, diagrams. (E13)

225-E. **Foundry Techniques. Gating for Shell Moulding Castings.** M. R. Hinchcliffe. *Metal Industry,* v. 88, Jan. 27, 1956, p. 63-65.

Treatment of some of the difficulties encountered in foundry practice. Characteristics of the shell mold, layout of runners and gates, special problem of feeding heads. Diagrams. (E22, E16)

226-E. **How to Make Good Test Bars.** Frank J. Daniels. *Modern Castings,* v. 29, Feb. 1956, p. 29-30.

Selecting the proper test casting, standardizing melting and pouring procedures, recommended procedures. Diagrams, photograph. (E general)

227-E. **Pneumatic Reclaimer Lengthens Life of Sand.** Alexander D. Barczak. *Modern Castings,* v. 29, Feb. 1956, p. 24-27.

Reclaim system includes equipment for screening and feeding used sand, pneumatic scrubbing unit proper, an air cascade-type classifier, a dust collector, and dump buckets to bring used sand to the installation and transport reclaimed sand. Diagrams, graph, photographs, tables. (E18)

228-E. **Five Ways to Use Zircon Sand.** Albert L. Kreuer. *Modern Castings,* v. 29, Feb. 1956, p. 31.

Use of zircon with new techniques, methods, equipment and mechanization to equalize rising cost of casting metals. Photograph, table. (E18, Zr)

229-E. **It's Easy to Try Basic.** J. D. Sheley. *Modern Castings,* v. 29, Feb. 1956, p. 32.

Experimentation with air-placing a basic refractory on the regular acid lining of production cupolas. Photograph. (E10)

230-E. **Investment Casters Bid for New Role.** *Steel,* v. 138, Feb. 20, 1956, p. 122, 125.

Investment casting of parts for automobile gas turbines is evaluated. Photographs. (E15)

231-E. (Czech.) **Methods for the Choice of a Suitable Chemical Composition of Gray Iron Castings.** Karel Hanak. *Slévarenství,* v. 4, no. 1, Jan. 1956, p. 10-16.

Graphic methods for choice of chemical composition of gray iron castings, worked out in form of nomograms. Tables, graphs, diagrams. 14 ref. (E25, CI-n)

F

Primary Mechanical Working

64-F. **Studies in Cold-Drawing. III. Determination of Friction Coefficient.** H. Majors, Jr. *ASME, Transactions,* v. 78, Jan. 1956, p. 79-85.

Average coefficients of drawing friction determined for forward and reversed drawing of 2S-O aluminum and SAE 1020 steel by Sachs' theory and compared with measurements using SR-4 wire strain gages on the outer die surface to determine die pressures. Tables, graphs, diagram. 21 ref. (F28, Q25, Al, CN)

65-F. **Canadian Metals' Review of Metalworking Technology.** *Canadian Metals,* v. 19, Jan. 1956 p.26 + 13 pages.

Assessment of up-to-date metalworking developments in iron and steel, nonferrous and special alloys, and techniques related to fabrication. (F general, G general, Fe, ST, Ni, Cu, Co, AY, Al)

66-F. **Extrusion of Light-Alloy Sections.** *Sheet Metal Industries,* v. 33, no. 345, Jan. 1956, p. 53-57.

Design and operation of new British extrusion plant with 5000 and 3000-ton piercing presses. Photographs. (F24, Al)

67-F. **Resistance to Deformation During Hot Rolling. VIII. The Rolling of Metals and Alloys.** *Sheet Metal Industries,* v. 33, no. 345, Jan. 1956, p. 59-64.

Method of calculating mean values of resistance to plane homogeneous deformation. Graphs, tables, diagram. 1 ref. (F23, Q24, Cu, CN)

68-F. **Productivity Problems Solved by Equipment, Methods Analysis.** Charles C. Tappero. *Western Metals,* v. 14, Jan. 1956, p. 54-57.

How detailed study of existing equipment and methods will help in selecting most efficient design and layout to provide maximum production at minimum cost. Examples of application of such studies to production in a wire mill. Photographs. (F28)

69-F. **Magnesium and the Heavy Press Program.** J. R. Douslin. Paper from "The User Speaks About Magnesium". Magnesium Association, 4 p.

Application and development of the heavy presses (up to and including 50 ton) on magnesium and aluminum from 1946, as related to the aviation industry. (F22, G1, Mg, Al, Ti)

70-F. **Slitting and Shearing Steel—and Costs.** *Finish,* v. 13, Feb. 1956, p. 20-21.

Operation of coil steel slitting and flying shear line which will save kitchen equipment manufacturer about $10 per ton of coil steel used. Photographs. (F29, ST)

71-F. **Soaking-Pit Practice.** R. H. Slade. *Iron and Steel Institute, Journal,* v. 182, Jan. 1956, p. 3-9.

Deals with results of 3½ years' experience of operating a battery of 20 bottom-fired Amsler-Morton soaking pits. Results show how modern advances in pit construction and instrumentation have permitted great improvements in soaking-pit heating, in regard to both fuel efficiency and steel quality. Tables, graph, diagrams, photographs. (F21, ST)

72-F. **The Investigation of the Wire Drawing With Die Generated by Conical Section.** Toshio Nishihara, Mutsuo Kakuzen and Hiroshi Nakamura. *Kyoto University, Engineering Research Institute Technical Reports,* v. 5, no. 4, Aug. 1955, p. 75-115.

Effects of drawing conditions on properties of the drawn wires from the standpoint of theory and experiment. Diagrams, graphs, tables. 4 ref. (F28)

73-F. **The Modern Electric-Weld Steel Tube Mill.** F. Spicer. *Metalworking Production,* v. 100, Jan. 13, 1956, p. 63-68.

A British cold roll forming and electric-weld tube mill described; includes roll design, resistance welder, welding operations, take-off section. Graph, diagrams, photographs, table. (F26, ST)

74-F. **New Welding Process for Tubing.** *Steel Processing,* v. 42, Jan. 1956, p. 20, 54.

Process developed to manufacture welded stainless steel and high alloy tubing and pipe. Rolls of the continuous mill were inverted and

the formed tubing welded from the underside, thereby permitting gravity to eliminate the weld bead on the inside diameter of the tubing. Photograph. (F26, SS, AY)

75-F. Wire-Drawing Lubrication. . . Where Do We Go From Here? R. Tourret. *Wire Industry,* v. 23, Jan. 1956, p. 41-44, 56.

Problems in lubricating dies and research directed at prolonging life of dies and reducing power requirements. Photograph, graphs, diagram. 5 ref. (F28, F1)

76-F. (Czech.) **Effect of Wire Drawing Processes on Drawing. Ability and Mechanical Properties of Soft Steel Wires.** Oldrich Modracek. *Hutnické listy,* v. 10, no. 12, Dec. 1955, p. 715-720.

Changes in mechanical properties during the drawing of wires from soft carbon steels, produced by the openhearth process, are compared. Effect of the oxygen during refining and of storage time on properties of drawn wires determined. Tables, graphs. 2 ref. (F28, Q23, CN)

77-F. (Italian.) **Influence of Small Work Hardenings on the Mechanical and Technological Properties of Steel Strip.** L. Dainelli and L. Cocciolo. *Metallurgia Italiana,* v. 47, no. 11, Nov. 1955, p. 501-504.

Studies were made on soft, cold-rolled and annealed strip for purposes of improving surface appearance. Graphs. (F23, ST)

78-F. (Russian.) **Complex Automation of Blooming Mills.** A. G. Birfel'd, E. G. Gnilosyrov, O. V. Slezhanovskii and N. A. Tishchenko. *Elektrichestvo,* no. 12, Dec. 1955, p. 9-18.

Efficiency, speed and output, before and after modernization. Circuits and equipment for automatic regulation of blooming-mill components. Table, graphs, circuit diagrams, oscillogram. (F23)

79-F. Instrumentation of a 14-In. Experimental Rolling Mill. First Step —Measurement. S. S. Carlisle and G. W. Alderton. *British Steelmaker,* v. 22, Feb. 1956, p. 44-48.

Measurement of factors involved in establishing an automatic control system. Diagrams, photograph. (To be continued) (F23, S18, ST)

80-F. Five Ways to Stretch Wire Production. Charles C. Tappero. *Steel,* v. 138, Feb. 6, 1956, p. 126, 129, 132.

Speed and quality of production can be increased by improvement of old equipment, better maintenance programs and better division of workload. Photographs. (F28)

81-F. Colloidal Graphite as a Wire-drawing Lubricant. D. G. Weaver. *Wire and Wire Products,* v. 31, Feb. 1956, p. 184-185, 229-232.

Broad range of wiredrawing applications for colloidal graphite. Photographs, graphs. (F28, F1)

82-F. Wire Drawing Lubricants. Fritz Rabenhorst. *Wire and Wire Products,* v. 31, Feb. 1956, p. 196, 238-239.

Composition and applications of various dry, paste and wet lubricants. (F28, F1, Cu, Al)

83-F. Manufacture of Aluminum Conductor Telephone Cable. James S. Herbert. *Wire and Wire Products,* v. 31, Feb. 1956, p. 178-182, 240-242.

Copper manufacturing machinery was modified for aluminum. Summary of engineering, production and operating results. Diagrams, graphs, tables, photographs. (F28, T1, Al)

84-F. (Polish.) **Analysis of Formulas for the Coefficient of Mean Elongation of Rolled Iron Shapes.** Z. Wusatowski and K. Rytel. *Prace Instytutow Ministerstiwa Hutnictwa,* v. 7, nos. 5-6, Dec. 1955, p. 253-269.

Comparison of several formulas by mathematical analysis for the real coefficient of elongation. Tables, graphs, diagrams. 12 ref. (F23, Q24, Fe)

G Secondary Mechanical Working

101-G. Propane Gas for Metal Cutting. G. G. M. Carr-Harris. *Canadian National Research Council, Technical Information Service Report No.* 46, Dec. 1955, 15 p.

Discussion of propane as a fuel for both domestic and industrial use, and the process of oxy-gas cutting. References on LP-gas for metal cutting are listed. 42 ref. (G22)

102-G. Application of Adhesive Tapes in the Metal Working Industries. *Machinery (London),* v. 87, Dec. 30, 1955, p. 1507, 1555.

Uses include masking for painting, protection of polished metal surfaces during machining or pressing operations, holding parts in place during assembly, marking edges of gangways and machining areas, sealing joints, identification of materials. (G general, L26, S10)

103-G. Accelerated Slide Motions Increase Output of Draw Presses. Ernest C. Morse. *Modern Industrial Press,* v. 18, Jan. 1956, p. 15-18.

Drag link drive, special linkages, dynamatic clutch, double clutch and the two-speed planetary clutch are all considered practical for accelerating the slide motions of lead draw presses. Methods and applications. Photographs. (G4)

104-G. Some Aspects of the Use of Ferritic Chrome Iron in Sheet Form. J. N. Edwards and A. A. Pearson. *Sheet Metal Industries,* v. 33, no. 345, Jan. 1956, p. 17-23; disc., p. 23-24, 40.

A 17% chromium iron is considered with particular reference to its workability, manufacture, resistance to corrosion and electrolytic polishing. Phototgraphs, tables. (G general, R general, L13, SS)

105-G. Reducing Costs in the Manufacture of Hollow-Ware. J. W. Langton. *Sheet Metal Industries,* v. 33, no. 345, Jan. 1956, p. 43-46.

Mechanization in hollow-ware manufacture accelerates production and reduces costs. Manufacturing operations described. Diagrams, photographs. (G1)

106-G. Ford Operating New Cleveland Stamping Plant. *Steel Processing,* v. 42, Jan. 1956, p. 37-41, 50.

Notable features are use of latest automation techniques, elaborate materials handling devices, modern quality control methods. Photographs. (G3, A5, S12)

107-G. Machining Germanium to Conserve Material. Robert L. Crane. *Tool Engineer,* v. 36, Feb. 1956, p. 85-87.

Design, operation and applications of machine for precision slicing germanium into small pieces for use in transistors. Photographs, diagram. (G17, T1, Ge)

108-G. Retooled Punch Press Setup Stamps Out Parts 200% Faster. Howard E. Jackson. *Western Metals,* v. 14, Jan. 1956, p. 63-65.

How metal forming machines have been adapted to efficient production of aluminum draperies, awnings, venetian blinds, etc. Punch presses installed in the stamping department are equipped with automatic coil stock reel, progressive dies fed by Dickerman hitch, roll feeds and air ejectors. This setup has increased production 200% over old method of shearing and hand feeding pieces into machine. Photographs. (G2, G3, Al)

109-G. New Heliarc Cutting for Non-Ferrous Metals Trims Cost, Permits Saw-Like Quality Cuts. *Western Metals,* v. 14, Jan. 1956, p. 66-67.

New process for cutting and shaping aluminum and other nonferrous metals. Advantages are speed, ease of application mechanically or manually, smooth cut surface, high efficiency and easy adaptability to position and contour. Diagrams, photographs. (G22, Al)

110-G. The Cold Roll Forming Process. *Automobile Engineer,* v. 46, Jan. 1956, p. 34-36.

A rapid and accurate method for producing a wide variety of shapes. Photographs. (G11)

111-G. Present Position and Knowledge of Peening. Otto Forsman. *British Welding Journal,* v. 3, Feb. 1956, p. 49-52.

Methods and effect of peening. 13 ref. (G23)

112-G. New Carbide Tool Drills Cast Iron Ten Times Faster. *Iron Age,* v. 177, Feb. 9, 1956, p. 87-89.

Precision hole drilling at rates up to 60 ipm. in solid cast iron, bronze and aluminum, and up to 20 ipm. in steel is possible with a new carbide tipped tool. Hollow drill produces both chips and solid core. Regrinding is simple. Photograph, table, diagram. (G17, CI, Al, Cu, ST)

113-G. Control Heat to Drop Titanium Forming Costs. A. E. Leach and H. M. Lundstrom. *Iron Age,* v. 177, Feb. 9, 1956, p. 98-101.

Hot forming minimizes springback, thus reducing time, labor and cost of fabrication. Photographs, table, graphs. (G general, Q21, Ti)

114-G. Leaded Forging Steels. Kenneth Rose. *Materials & Methods,* v. 43, Jan. 1956, p. 104-105.

Leaded steels are desirable for forged parts when good machinability is needed. Chemical composition, applications and method for adding lead. Photographs, table. (G17, F22, Pb, ST)

115-G. Power and Carbide Mill Rotor Slots. A. Maerkle. *Metalworking Production,* v. 100, Jan. 13, 1956, p. 47-54.

Cutting forces involved, tests to determine optimum speeds and feeds consistent with favorable tool life; analysis of costs. Diagrams, graphs, photographs, tables. (G17)

116-G. Forming Titanium Sheet. Richard E. Pitts. *Product Engineering,* v. 27, Feb. 1956, p. 135-139.

Specific design recommendations for simple bending, drawn flanges, rubber forming, stretch forming and drop hammer forming; allowances for springback; how to prevent waviness in flanges and oil-can buckling; design of beaded panels; limitations in forming large radii. Diagrams, graphs. (G general, Ti)

117-G. Flame Cutting for Nonferrous Metals. R. M. Gage. *Product Engineering,* v. 27, Feb. 1956, p. 170-173.

Advantages of torch cutting, as applied to steel, are brought to shaping and cutting nonferrous metals such as aluminum, copper and brass. Photographs, tables. (G22, Al, Cu)

118-G. Taps and Tapping. Alan G. Dimond. *Western Machinery and Steel World,* v. 47, Feb. 1956, p. 68-71.

Tapping operations in the production of the M59 armored personnel

carrier. Photographs, tables. (G17, ST)

119-G. Deep-Drawn Electronic Cases. *Western Machinery and Steel World,* v. 47, Feb. 1956, p. 82-84.

Burbank firm has developed techniques and equipment which make deep drawing pay off even on short runs. Photographs. (G4)

120-G. (Czech.) **Machining Sintered Carbides by Electrical Methods.** J. Zizala. *Strojirenska vyroba,* v. 3, no. 8, Aug. 1955, p. 312-313.

Advantages of electrical methods over usual grinding and polishing by diamonds or silicon carbide. Factors affecting efficiency of electro-machining method, quality of tool surfaces obtained. Graphs, micrographs. 3 ref. (G18, C-n)

121-G. (Czech.) **Use of Electro-Erosion Method for Intricate Parts and for Rehabilitating Worn Dies.** F. Petrasek. *Strojirenska vyroba,* v. 3, no. 9, Sept. 1955, p. 365-367.

Development of electro-erosion for machining complex slots and splines for steam-turbine vanes and for renewing worn dies and inserts. Equipment and operating instructions, including electrode, voltage, cooling liquid. Photographs, diagrams. (G17, C-n)

122-G. (Czech.) **Hot Forming With Electric Resistance Heated Dies.** A. Schaffer and M. Blazek. *Strojirenska vyroba,* v. 3, no. 9, Sept. 1955, p. 368-370.

Heating the blank right in the die results in improved mechanical properties of parts formed, elimination of subsequent machining, and better release from die. Tables, diagrams. (G1, Q general)

123-G. (French.) **Electro-Erosion and Electric-Spark Machining; Present Status and Future Prospects.** Marc Bruma. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 22, no. 1, Jan. 1956, p. 18-22.

Historical review of process. Influence of different factors on machining rate, surface finish, electrode wear. Table, diagram, micrographs, graph, photographs. 23 ref. (G17, SS, AY, Ni, Al)

124-G. Blow Stampings and Use Cheaper Dies. Wallace C. Mills. *American Machinist,* v. 100, Feb. 13, 1956, p. 121-123.

Describes low-cost, high-speed process by which small, light, metal stampings are blanked and drawn in one punch press and blown to other presses for secondary operations. Equipment consists of a chute with a compressed-air blast and a lateral slide-feed die. Diagrams. (G2, G3)

125-G. Use Multiple-Item Templates and Electronic Controls in Flame Cutting. *Industry & Welding,* v. 29, Feb. 1956, p. 65-67, 118.

Methods for mass producing weldment parts that are uniformly accurate and fit precisely and smoothly, assuring maximum strength with minimum of weld time and human supervision. Photographs. (G22, ST)

126-G. Transfer Machine Makes Crankshafts Initially Straight. W. G. Patton. *Iron Age,* v. 177, Feb. 23, 1956, p. 87-89.

A four-station automatic transfer unit does a very accurate job on initial machining of crankshaft forgings. Photographs, diagram. (G17)

127-G. Continuous Line Stamps, Welds Housings Faster. Herbert Chase. *Iron Age,* v. 177, Feb. 23, 1956, p. 90-93.

In revamping a production setup to accommodate 0.180-in. thick sheet steel required in a new housing design, it was found possible to shift to less costly and more easily handled coil stock. Photographs. (G3, K1, ST)

128-G. A Radioactive Study of the Metal-Cutting Process. I. Finnie and E. Rabinowicz. *Lubrication Engineering,* v. 12, Jan.-Feb. 1956, p. 29-31.

Autoradiographs were taken of tools used to cut radioactive copper. The variation of metal transfer to the tool was determined as function of rake angle, depth of cut and type of cutting fluid. Diagrams, tables, autoradiographs. 7 ref. (G17)

129-G. Face Milling Titanium 150A. L. Fine and F. Menelaus. *Machinery (London),* v. 88, Feb. 3, 1956, p. 210-212.

Cutter geometry and design, tooth loading, workpieces used for tests, test results. Photographs, diagrams. (G17, Ti)

130-G. Metal Machining. VI. Cutting Fluids. W. Alfred Carter. *Machinery Lloyd (Overseas Ed.)* v. 28, Jan. 21, 1956, p. 69-75.

Cutting fluids and methods of application for most efficient dispersion of heat. Photographs, diagrams. (G17)

131-G. Working Stainless Steels. J. Lomas. *Machinery Lloyd (Overseas Ed.)* v. 28, Jan. 21, 1956, p. 83-85.

Procedures for working and characteristics of martensitic, ferritic and austenitic types as they affect working methods. (G general, F22 SS)

132-G. Electric Arc Cutting. *Metal Industry,* v. 88, Jan. 27, 1956, p. 67-68.

Nonferrous metal cutting by a method which is easy to operate either mechanically or manually, applicable to circular and contour cutting, which greatly increases the shaping speed and leaves smooth cut faces. Photographs, diagram, table. (G22, Al)

133-G. Nomograph for Grinding Costs. William G. Slack and James T. Zawodni. *Steel,* v. 138, Feb. 6, 1956, p. 118-119.

Construction and use of nomograph for constant check on grinding cost per billet ton, or cost per pound of metal removed. Nomograph. (G18)

134-G. Shot Peening for Safety. *Steel Processing,* v. 42, Feb. 1956, p. 103-104, 110.

Propellers are shot peened to improve fatigue strength of material at points of greatest stress. Machines, operations and abrasives discussed. Photographs. (G23, Q7, Al, ST)

135-G. Error Diagnosis in Carbide Trouble Shooting. Antoni Niedzwiedzki. *Tooling and Production,* v. 21, Feb. 1956, p. 75, 76, 130, 132.

A guide in carbide trouble shooting. Discussion follows an error determination chart, giving a survey of different machining troubles as a function of tooling or of operating. Table. (G17)

136-G. How Cutting Rates Can be Adjusted to Extend Tool Life. B. Gisner, W. Ohlson and G. Heden. *Tooling and Production,* v. 21, Feb. 1956, p. 83 + 4 pages.

Report on a turning investigation on bars of steel SAE 1086 of various carbide grades, to determine the best ratio of speed to feed for a minimum of tool wear. Graphs, photographs. (G17, ST)

137-G. Machining Work-Hardened Alloy Steels. II. W. M. Halliday. *Tooling and Production,* v. 21, Feb. 1956, p. 87 + 4 pages.

Efficient and economical means for overcoming work hardening so that machining may be completed. Diagrams. (G17, G18, AY, SS)

138-G. Comparative Testing Confirms Oxypropane Cutting Value. Jay Bland. *Welding Engineer,* v. 41, Feb. 1956, p. 22-24.

Compares characteristics of oxy-propane and oxy-acetylene in the cutting of steel. Photographs, tables. (G22, ST)

139-G. New Concepts in Cold Roll Forming Boost Use of Special Shapes. *Western Metals,* v. 14, Feb. 1956, p. 53-55.

Advantages include close tolerances, smooth, clean surfaces, uniformity of thickness and profile and simplicity of process. Some new applications of cold rolled shapes are listed. Photographs. (G11, ST)

140-G. (Book-German.) **Production and Use of Cooling Fluids and Lubricants in Metal Cutting.** R. N. Oscher. (Translated from the Russian by Elfriede Bluhm.) 182 p. 1954. Fachbuchverlag, Leipzig, Germany.

Properties, applications, selection, composition, conditioning of unstable emulsions, special characteristics, recovery, and safety measures. (G21)

H
Powder Metallurgy

40-H. Interaction Between Metals and Atmospheres During Sintering. John T. Norton. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Jan. 1956, p. 49-53.

Discusses adsorbed gases, evaporation of metals during sintering, reduction and carburization, surface tension and activated sintering. 11 ref. (H15)

41-H. Some Observations on Sintered Steel Powder Compacts. A. A. Krishnan and B. Halder. *Journal of Scientific & Industrial Research,* v. 14, sec. B, Dec. 1955, p. 643-651.

Investigation of sintering process with respect to volume, density, hardness, resistivity and size and shape of pores. A model demonstrating the interface energy theory of sintering is suggested. Diagrams, graphs, tables, micrographs. 13 ref. (H15, ST)

42-H. Can Powdered Metallurgy Save You Time and Money? Yes . . . Here's How! Samuel Bradbury, III, and George Karian. *Machine and Tool Blue Book,* v. 51, Feb. 1956, p. 105-111.

Among advantages are low tool cost, close tolerances, low production cost and high production rate, low material waste, and reduction of 10 to 50% in machining. Processes and equipment described. Photographs, diagram. (H general)

43-H. An Investigation of Boride Cermets. J. A. Stavrolakis, H. N. Barr and H. H. Rice. *American Ceramic Society Bulletin,* v. 35, Feb. 1956, p. 47-52.

Fabrication and properties of hot-pressed bodies composed of manganese, boron and silicon metal and manganese, calcium and silicon borides. Tables, micrographs. 3 ref. (H general, Mn, Si, B, Ca)

44-H. Cermets: I. Fundamental Concepts Related to Microstructure and Physical Properties of Cermet Systems. Michael Humenik, Jr., and Niranjan M. Parikh. *American Ce-*

ramic Society, Journal, v. 39, Feb. 1956, p. 60-63.

Evaluation of the microstructure of tungsten carbide and titanium carbide base cermets on the basis of wettability of the carbide phase. Diagrams, graphs, micrographs, tables. 6 ref. (H general, M27, Ti, W)

45-H. An Oxidation Study of Cobalt-Alumina Mixtures. W. B. Crandall and R. R. West. *American Ceramic Society Bulletin,* v. 35, Feb. 1956, p. 66-70.

Weight change, differential thermal and X-ray diffraction analysis data used to propose a mechanism by which oxidation proceeds in porous compacts. Diagram, tables, graphs. 15 ref. (H general, R2, Co)

46-H. Pressing and Sintering Metal Powders. G. R. Bell. *Chemical Metallurgical & Mining Society of South Africa, Journal,* v. 56, Jan. 1956, p. 259-276.

Principles by which powders can be pressed into strong compacts and sintered to develop high mechanical strength. Tables, diagrams, graphs, micrographs. (H14, H15)

47-H. At 1600° F+ Try Molybdenum Disilicide for Strength, Oxidation Resistance, Corrosion Resistance. *Materials & Methods,* v. 43, Jan. 1956, p. 131, 133.

Molybdenum disilicide will find many elevated temperature applications where only moderate resistance to thermal shock is required. Fabrication and properties discussed. Photographs, table. (H general, Mo)

48-H. Get Those Sharp Corners Without Machining. *Precision Metal Molding,* v. 14, Feb. 1956, p. 53, 64.

An example of the use of powder metallurgy in producing angles without appreciable radius. Photograph, diagram. (H general)

49-H. Powder Metallurgy for Research Into Ferromagnetic Materials. C. E. Richards, E. V. Walker and A. C. Lynch. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 131-133.

Effect of processing variables on purity and magnetic properties of products. Graphs. 7 ref. (H general, P16)

50-H. The Use of Powder Metallurgy in the Production of Soft Magnetic Materials. H. Evans, C. Gordon Smith and D. K. Worn. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 134-141.

Review of powder metallurgy techniques and applications. Effects of fabrication procedures on properties. Tables, micrographs, photograph, diagrams, graphs. 14 ref. (H general, SG-p)

51-H. (German.) **Dilation and Contraction of Polycrystalline Pressed Articles Under the Influence of Heat.** K. Kohler. *Metall,* v. 10, nos. 1-2, Jan. 1956, p. 21-29.

Factors influencing dimensional changes under application of heat include size and structure of grains, inner surfaces, absorbed gas volume, pressure and pressure direction applied to the item and temperature. Tables, graphs, diagram. 31 ref. (H11, EG-a, Fe)

52-H. (Russian.) **Strength of Sintered-Carbide Disks as Affected by the Quantity of Fine Tungsten Carbide Grains.** *Metallovedenie i obrabotka metallov,* supplement to no. 6, Dec. 1955, p. 61-63.

Microstructural variations. Yield strength in bending for various percentages of finer grains. Micrographs, table, graph. (H general, Q23, C-n)

53-H. Density Distribution in Metal Powder Compacts. G. C. Kuczynski and I. Zaplatynskyj. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 215.

Density distribution is obtained from relationship between hardness and density, found by measuring hardness and densities of thin compacts. Graphs, 2 ref. (H11)

54-H. (German.) **Investigation of the Sintering Process of Copper-Nickel by Magnetic Analysis, With Special Consideration to Short Sintering Time.** K. Torkar and H. Mariacher. *Planseeberichte für Pulvermetallurgie,* v. 3, no. 3, Dec. 1955, p. 78-86.

Preparation of samples, determination of activating energy, possibilities of superstructure formations. Graphs, micrographs. 10 ref. (H15, P16, Cu, Ni)

55-H. (Book.) **Powder Metallurgy.** Technical Assistance Mission No. 141. 309 p. 1955. Organisation for European Economic Co-operation, 2, rue Andre-Pascal, Paris, France.

Subject is organized into the following four groups: electrical and magnetic materials; hard metals; refractory materials; engineering powders and structural parts. (H general)

J Heat Treatment

72-J. New Radiant Gas-Fired Method Speeds Die Block Heating. H. C. Grim. *American Gas Journal,* v. 183, Jan. 1956, p. 23-25.

New furnace heats blocks 4½ times faster, increasing production while consuming 20% less fuel. Photographs, graph, table. (J general, ST)

73-J. Differential Annealing. E. G. Maeder. *Engineering,* v. 181, Jan. 13, 1956, p. 48-52.

Controlled radial variation in temper of circle yields better product with 60% cupping reduction. Annealing process and apparatus. Photographs, diagrams, graphs. (J23, G4)

74-J. Technical Advancements Lead Industrial Heating Equipment Industry to Record-Breaking 1955. Carl L. Ipsen. *Industrial Heating,* v. 23, Jan. 1956, p. 23-24, 26.

Summary of 1955 progress, outstanding new installations. (J general)

75-J. The Status of Combustion in Industrial Furnaces. J. J. Turin. *Industrial Heating,* v. 23, Jan. 1956, p. 28 + 6 pages.

Applications of combustion in industry and related problems. (J general)

76-J. Heat Transfer in Industrial Heating Furnaces: II. M. H. Mawhinney. *Industrial Heating,* v. 23, Jan. 1956, p. 54 + 7 pages.

Data on heating steel, copper and aluminum under various conditions. Tables. (J general, ST, Cu, Al)

77-J. Background for Practical Heat Treatment of Various Titanium Alloy Types. Paul D. Frost. *Journal of Metals,* v. 8, Jan. 1956, p. 35-39; disc. p. 39-42.

Basic mechanisms of hardening, practical application of heat treatments and problems encountered. Tables, graphs. (J general, Ti)

78-J. The Metallographic View. XVIII. Too Much Hardenability. Howard E. Boyer. *Steel Processing,* v. 42, Jan. 1956, p. 23-24.

Accounts for the frequent cracking in sections of parts, made from alloy steels possessing excessive hardenability, during heat treatment, in the stock room or in service. Diagram, graph. (J26, AY)

79-J. Record '55 for Heat Treat Equipment; West's Developments Pace Progress. Carl L. Ipsen. *Western Metal,* v. 14, Jan. 1956, p. 72-73.

New installations in some West Coast plants, among them a system for direct positive, fully automatic means of controlling amount of active carbon in the furnace atmosphere, a newly designed system for martempering long steel aircraft weldments, and a 60-ton per hr., 2000 ft. per min. tin plate annealing line which has twice the speed and capacity of previous systems. Photographs. (J general)

80-J. Electrospark Surface Hardening of Metallic Objects. G. P. Ivanov and N. D. Titov. *Henry Brutcher Translation* No. 3544, 6 p. (Abridged from *Liteinoe proizvodstvo,* 1953, no. 1, p. 21-22.) Henry Brutcher, Altadena, Calif.

Presents the EAI-1 electrosparking machine, its application, economics and effects on microstructure. Tables, diagram, photographs, micrographs. (J28, M27)

81-J. (Russian.) **Formation of Cracks in Case-Hardened Parts and Preventive Measures.** E. I. Malinkina. *Metallovendenie i obrabotka metallov,* no. 5, Nov. 1955, p. 24-28.

Internal cracks, below case, are formed during quenching from gas-carburizing furnace and can be corrected without reheating. Slow tempering avoids external cracks which arise during quenching from low temperatures leading to martensitic structure throughout carburized layer. Surface cracks appear during slow cooling in air, but can be eliminated by changing the cooling rate in upper range of transformation temperatures. Micrographs, photograph. 7 ref. (J26, Q23, AY)

82-J. Induction-Heating. D. Warburton-Brown. *Aircraft Production,* v. 18, Feb. 1956, p. 42-46.

Fundamental principles and problems of application to production processes. Photographs. (J2)

83-J. Heat-Treatment of Welded Alloy Steels. *British Welding Journal,* v. 3, Feb. 1956, p. 52-53.

Table summarizing usual heat treatment practice. Table. (J general, AY)

84-J. Bright Hardening of Stainless Steels. Fred Hunter. *Industrial Gas,* v. 34, Feb. 1956, p. 14-16.

Versatile high-temperature gas-fired muffle furnace, has upgraded production and has increased overall customer service by achieving economical, commercially practical bright hardening of stainless steels. Diagram, photographs, table. (J26, SS)

85-J. 1955—A Record Year for the Heat Treating Industry. Carl L. Ipsen. *Iron and Steel Engineer,* v. 33, Jan. 1956, p. 169-170.

Trends in operating procedures and processes in the heat treating of iron and steel. (J general, ST, Fe)

86-J. Annealing Large Stainless-Steel Weldments. Horace C. Knerr. *Machinery,* v. 62, Feb. 1956, p. 163-166.

Methods of handling and treating large austenitic weldments to remove cold working stresses and put carbides into solution. Photographs. (J23, SS)

87-J. Heat-Treating Parts for the Buick Dynaflow. Herbert Chase. *Ma-*

chinery, v. 62, Feb. 1956, p. 179-182.
Describes and illustrates automatic apparatus for heat treating transmission parts. Photographs. (J2)

88-J. Steel Heat Treating Temperatures and Hardness After Treatment. *Materials & Methods*, v. 43, Jan. 1956, p. 127.
Tables giving heat treatment data. (J general, Q29, ST)

89-J. Tool Steel Annealing. *Metallurgia*, v. 53, no. 315, Jan. 1956, p. 34-36.
Discussion of isothermal annealing and description of furnaces, charging machine and product control features in new British heat treatment plant. Photographs. (J23, TS)

90-J. Nondestructive Case Depth Measurements. Robert H. McCreery. *Metal Progress*, v. 69, Feb. 1956, p. 70-71.
Depth controlled in production by measuring Rockwell hardness of the surface and comparing it to predetermined limits specified on a series of control charts. Graph. (J28, S18)

91-J. Heat-Treatability of Ti-6Al-4V. R. G. Sherman and H. D. Kessler. *Titanium Metals Corporation of America, Titanium Engineering Bulletin No.* 2, 12 p.
Heat treatment, stress stability, section size, elevated temperature tensile and fatigue studies on material from production ingots of the alloy. Micrographs, graphs, tables. (J general, Q general, Ti)

92-J. (German.) **The Effect of Alloying Elements on the "Case-Hardenability" of Case-Hardening Steels.** Hans Ulrich Meyer. *Stahl und Eisen*, v. 76, no. 2, Jan. 26, 1956, p. 68-77; disc., 77-78.
Investigation of case hardenability of 23 American and German steels, partly standardized and partly melted on an experimental basis, of the following types: manganese-molybdenum, manganese-chromium, manganese-chromium-molybdenum, manganese - chromium - vanadium, chromium-nickel, nickel-molybdenum and chromium-nickel-molybdenum. Effect of carbon and of alloying elements on case hardenability and on maximum hardness in rim zone. Tables, graphs, diagrams. (J28, AY)

93-J. (German.) **Reduction of the Heat Consumption in the Annealing of Steel Castings.** Gottfried Prieur and Günter Fechner. *Stahl und Eisen*, v. 76, no. 2, Jan. 6, 1956, p. 78-81.
Heat consumption before and after investigations, effect of annealing time, production rate, weight per piece, design of new furnace. Photographs, graphs, diagrams, table. 3 ref. (J23, CI)

94-J. (Russian.) **Properties of Sylvinite as a Medium for Heating in the Quenching of Steel Parts.** E. A. Stol'nikov. *Metallovedenie i obrabotka metallov*, no. 6, Dec. 1955, p. 25-32.
Use of sylvinite in electrode and crucible salt baths as medium for heating in the quenching and normalization processes. Baths with molten sylvinite can be used between 780 and 950° C.; below this range, sylvinite must be mixed with barium or potassium chlorides. Tables, graphs. 6 ref. (J2, CN, AY)

95-J. (Russian.) **Isothermal Quench Hardening of Springs and Coils Made of Steel 55S2.** V. S. Men'shov. *Metallovedenie i obrabotka metallov*, no. 6, Dec. 1955, p. 32-36.
Comparison of mechanical properties of train springs after isothermal quenching and after usual heat treatments. Isothermal quenching eliminates need for tempering and minimizes buckling. Table, micrographs, graphs. 1 ref. (J26, CN)

96-J. (Russian.) **Furnace for Heat Treatment of Metals in Vacuum.** E. N. Marmer. *Metallovedenie i obrabotka metallov*, no. 6, Dec. 1955, p. 36-40.
Design, operation and advantages. Furnace eliminates need for subsequent pickling or mechanical cleaning necessitated by the oxidizing conditions in the usual furnace. Diagram, table. 9 ref. (J2)

97-J. (Russian.) **Method of Gas Carburizing That Employs a Solid Carburizer.** P. I. Shashkin. *Metallovedenie i obrabotka metallov*, no. 6, Dec. 1955, p. 40-44.
Carburizing agent may not be packed densely, but small lumps rest lightly against and around part to be case hardened. Thus, this is still essentially gas cementation. Microstructure, hardness, depth and homogeneity of resulting product. Photographs, micrographs, diagram. 2 ref. (J28, M27, Q29, ST)

98-J. (Russian.) **Intensification of the Carburizing Process in a Solid Carburizer for Automobile Parts.** A. M. Tarasov and M. R. Semenchenko. *Metallovedenie i obrabotka metallov*, no. 6, Dec. 1955, p. 45-51.
Effect of temperature on growth of austenitic grains in alloy steels. Character of heating of parts in carburizing box at 910 and 950° C. Distribution of carbon in carburized layer, hardness and depth of layer. Micrographs, tables, graphs. 3 ref. (J28, N8, AY)

99-J. Modern Furnaces Work as a Team in Aluminum-Fabricating Shop. Charles A. Boz and W. E. Coon. *American Machinist*, v. 100, Feb. 13, 1956, p. 134-135.
A balanced production line consisting of a high-temperature solution-treating furnace, low-temperature aging furnace, quench tank and run-out table connecting the two furnaces, reduces supervision and time-cycle control problems as compared with individual batch furnaces, gives higher quality work because of more uniform heating. Photographs, diagrams. (J27, Al)

100-J. Flame Hardening Upgrades Gears. James P. Bates and C. A. Turner, Jr. *Steel*, v. 138, Feb. 6, 1956, p. 120-121.
Equipment and procedure for gas-air flame hardening to produce high-quality gears economically. Photograph, micrographs, table. (J2, ST)

101-J. Piston Pins Are 100% Surface Hardened for Better Service. R. E. Haislip. *Steel Processing*, v. 42, Feb. 1956, p. 107-110.
A finer grain steel and gas carburizing in a special prepared atmosphere result in shorter production cycle, increased uniformity, greater strength. Carburizing process described. Tables, photographs, diagram. (J28, ST)

102-J. Big Problems Are Commonplace in Flame-Treating Oil Industry Tools. R. F. Arnoldy. *Welding Engineer*, v. 41, Feb. 1956, p. 28-30.
Methods of flame hardening oil industry tools. Photographs. (J2)

103-J. Important Technical Advances Made in Heat Treating of Wire in '55. Carl L. Ipsen. *Wire and Wire Products*, v. 31, Feb. 1956, p. 202, 232.
Highlights summarized. Future trends appear to be centered on increased mechanization and quality control. (J general, F28, S12)

104-J. (Czech.) **Hardening, Heat Treatment and Surface Hardening of Gray and Spheroidal Cast Irons.** Otakar Moravek. *Slévarenství*, v. 4, no. 1, Jan. 1956, p. 16-20.
Effect of graphite form and distribution on improving mechanical properties, in addition to improving cast iron quality by hardening and heat treatment, which provides an economical design of high-grade castings. Tables, graph, micrographs. 10 ref. (J26, J28, Q general, CI)

105-J. (French.) **Construction and Performances of a Vacuum Furnace Capable of Reaching 1450° C.** A. Briot and J. Tourret. *Vide*, v. 10, no. 60, Nov.-Dec. 1955, p. 185-194.
Describes make-up of furnace and applications in the brazing of stainless steel without flux. Photographs, diagrams, tables, graph. 28 ref. (J general, K8, SS)

K

Joining

137-K. Adhesive Bonding of Metals. Samuel N. Muchnick. *Mechanical Engineering*, v. 78, Jan. 1956, p. 19-22.
Effect of various surface treatments for aluminum, stainless steel, magnesium and titanium on strength of adhesive-bonded joints. Contact angle which a water drop makes with treated surface shown to be effective tool for evaluating adequacy of surface treatment. Theoretical basis presented for bonding of metals by organic adhesives. Graph, table. (K12, Al, SS, Mg, Ti)

138-K. What's Ahead in Nonmanual Welding? Paul Reed. *Oil and Gas Journal*, v. 54, Feb. 6, 1956, p. 80-84.
Possible applications of nonmanual welding processes to pipe line operations. A new carbon dioxide process appears most promising, while several other processes show possibilities. Diagrams, photographs, graph. (K general)

139-K. Fabrication of Crosshead Beams for the World's Largest Forging Press. V. M. Nigriny. *Welding Journal*, v. 35, Jan. 1956, p. 9-18.
Preliminary tests and actual welding process. Successful results show that submerged arc welding can be used on heavy sections regardless of length or thickness. Photographs, diagrams, table, macrographs. (K1, T5, ST)

140-K. Carbon-Dioxide-Shielded Consumable-Electrode Arc Welding. G. R. Rothschild. *Welding Journal*, v. 35, Jan. 1956, p. 19-29.
Under carefully controlled operating conditions, carbon-dioxide-shielded arc welding of mild steel gives excellent results at low cost. Photographs, tables, graphs, radiograph. 13 ref. (K1, ST)

141-K. All-Welded 96-Ft. American-Built Motor Yacht. LaMotte Grover and E. H. Holder. *Welding Journal*, v. 35, Jan. 1956, p. 30-39.
Design and construction of all-welded pleasure craft in which distortion is controlled and noise and vibration are reduced to a minimum. Photographs, diagrams, table. (K1, ST)

142-K. Recent Developments in Inert-Arc Welding. F. J. Pilia. *Welding Journal*, v. 35, Jan. 1956, p. 40-46.
Research and development have brought inert-gas metal-arc welding and inert-gas tungsten-arc welding to the point where they are considered precision tools, aiding in the reduction of manufacturing costs. Photographs. (K1)

143-K. Welding an Aluminum Dump Body. W. C. Weltman, Jr. *Welding Journal*, v. 35, Jan. 1956, p. 49-50.
New alloys and welding methods make the use of aluminum in truck

bodies practical. Welding procedures described. Photographs. (K1, Al)

144-K. The Effect of I^2R Heating on Electrode Melting Rate. J. L. Wilson, G. E. Claussen and C. E. Jackson. *Welding Journal,* v. 35, Jan. 1956, p. 1S-8S.

Electrode melting rate is equal to sum of arc melting rate and I^2R melting rate of extension. Procedures and results of experimental melting rate determinations. Tables, photographs, graphs. 8 ref. (K1, ST, Al, Cu)

145-K. Austenitic Electrode of the 20% Cr, 10% Ni, 6% Mn, Ti Type for Automatic Welding. T. M. Slutskaya and S. M. Gurevich. *Henry Brutcher Translation No.* 3606, 15 p. (From *Avtomaticheskaya svarka,* v. 8, no. 3, 1955, p. 51-59.) Henry Brutcher, Altadena, Calif.

Hot cracks in the weld are caused by oxygen and sulfur. An electrode of chromium, nickel, manganese and titanium with flux "AN-22" was most satisfactory. Tables, micrographs. 15 ref. (K1, T5, AY)

146-K. The Marvibond Process. Willard de C. Crater. Paper from "The User Speaks About Magnesium". Magnesium Association, 6 p. + 3 plates.

Advantages of coating magnesium with plastic as used on luggage. Graphs, photographs. (K11, T10, Mg)

147-K. (French.) **"Riv-Cle"-Rivets and the Joining of Sheets Accessible Only on One Side.** B. Adaridi. *Revue de l'aluminium,* v. 32, no. 226, Nov. 1955, p. 1037-1041.

Several schemes to solve this problem are compared; details of the Riv-cle system diagrammed. Diagrams, photograph. (K13)

148-K. (Hungarian.) **Voltage and Characteristics of Electrical Welding Machines.** Karoly Kurutz. *Elektrotechnika,* v. 48, no. 12, Dec. 1955, p. 367-377.

Service conditions are based on static and dynamic characteristics. Dynamic properties are resolved. Graphs, diagrams. (K1)

149-K. (Russian.) **Electrical Butt Contact Welding in Pipe-Line Construction.** F. I. Kisliuk. *Neftianoe khoziaistvo,* v. 33, no. 12, Dec. 1955, p. 77-84.

Demonstrated on pipe-lines 300 to 500 mm. in diameter in the field, by means of a device equipped with a ring-transformer. Tables, diagrams, photographs. 4 ref. (K6, ST)

150-K. (Russian.) **Method of Determining Fluidity of Weld Metal.** A. A. Erokhin. *Zavodskaia laboratoriia,* v. 21, no. 12, 1955, p. 1466-1468.

Effect of arc-welding factors, including electrodes, flux, welding current, arc voltage and welding speed on weld-metal fluidity. Table, diagram. (K1, K9)

151-K. (Spanish.) **Study of Losses in the Consumption of Electrodes.** A. Pérez A. Quinones. *Ciencia y técnica de la soldadura,* v. 5, no. 27, Nov.-Dec. 1955, p. 1-3.

Factors that intervene in losses produced when the welder leaves the point of the electrode at an excessive length. Tables, graphs. (K1, ST)

152-K. Welding in the Steel Tube Industry. J. W. Atherton. *Australasian Engineer,* Dec. 1955, p. 51-53.

Applicability of welding and oxy-cutting to the maintenance, repair and construction problems of the tube industry. Photographs. (K1, K2, K3, F26, CN)

153-K. Projectiles Welded Automatically. V. N. Hansford. *Automation,* v. 3, Feb. 1956, p. 72-76.

Mechanism and operation of automatic machine producing welded rotating band on projectiles. Photographs, diagrams. (K1)

154-K. Some Aspects of Stainless Alloy Metallurgy and Their Application to Welding Problems. M. C. T. Bystram. *British Welding Journal,* v. 3, Feb. 1956, p. 41-46.

Influence of stainless alloying elements discussed on basis of Schaeffler's diagram, service conditions ranging from −200 to +900° C. being taken into account. Graphs, tables, micrographs. (K1, SS)

155-K. Practical Relationships Between Arc Energy, Fillet Size, and Amount of Electrode Used in Metal-Arc Welding. B. J. Bradstreet. *British Welding Journal,* v. 3, Feb. 1956, p. 59-61.

Relationship between certain metal-arc welding variables and sizes of the resulting welds summarized in formulas and graphs. (K1, ST)

156-K. Adhesives as a Design Tool. Arthur E. Kott. *Electrical Manufacturing,* v. 57, Feb. 1956, p. 87-93.

Major types of adhesives and their properties related to types of materials to be joined and to product applications. Diagrams, photographs, tables. 4 ref. (K12)

157-K. Effect of Fluxes on Soldered Connections. A. Z. Mample. *Electrical Manufacturing,* v. 57, Feb. 1956, p. 124-128.

Advantages of water-white rosin flux, for electrical and electronic wire joints over activated and proprietary fluxes, include a low melting point, possession of a controlled natural acid and a flux residue that is nonconductive, noncorrosive and nonhygroscopic. Graphs, tables. (K7)

158-K. Roll Welding Precious Metals for Telephone Contacts. A. L. Quinlan. *Electrical Engineering,* v. 75, Feb. 1956, p. 154-157.

Roll-welding circuits, equipment and layout, with special reference to welding of heavier tapes of precious metals. Specific applications. Diagrams, table, photographs. 1 ref. (K3, EG-c)

159-K. Nomograph Selects Size of Wire for Brazing. *Materials & Methods,* v. 43, Jan. 1956, p. 129.

Nomograph can be used to indicate wire diameter needed to silver braze a joint with known diameter, shear depth and clearance, or to determine length of wire needed to make a joint if a given wire gage is available. Diagram. (K8)

160-K. Flash Welding Jet Engine Rings. Arthur G. Portz. *Metal Progress,* v. 69, Feb. 1956, p. 67-71.

Flash welded rings have replaced forgings and castings in jet engine applications because of the savings in machining that are realized. To maintain the welding quality required, eight different variables must be predetermined and controlled. Photographs, graph, micrographs. (K3)

161-K. Automatic Riveting of Pierce Blank Templates. D. V. Montooth. *Western Machinery and Steel World,* v. 47, Feb. 1956, p. 80-81.

Drivmatic riveter has cut assembly time by 90%. Photographs. (K13, ST, Al)

162-K. Joining Aluminum to Stainless Steel. Morton C. Smith and David D. Rabb. Paper from "Proceedings of the 1954 Cryogenic Engineering Conference". NBS Report 3517, p. 39-48.

In the construction of transport Dewar flasks for liquefied gases, the many joints must be vacuum tight. Four successful methods included use of copper-plated, ultrasonic-timed and friction-timed aluminum, and aluminum-to-copper, joined to stainless steel tubing. Micrographs. (K7, SS, Al)

163-K. (Czech.) **Substitution of Welded for Cast Constructions and the Use of Cast Parts in Welded Constructions.** M. Hauner. *Strojirenstvi,* v. 5, no. 12, Dec. 1955, p. 888-893.

Factors determining choice of technology, methods of combining welded and cast parts in construction of machines, welding of castings. Diagrams, photographs. 15 ref. (K general, ST)

164-K. (Czech.) **Use of Induction Heating for Heat Treatment During Welding.** T. Unger. *Strojirenstvi,* v. 5, no. 12, Dec. 1955, p. 917-922.

Advantages of induction heating in welding of highly stressed parts, choice of frequency in relation to depth of heating, welding copper pipe of induction coils. Photographs. 7 ref. (K6, J2)

165-K. (Czech.) **Problems of the Present State of Resistance Welding.** Milan Vltavsky. *Zvaranie,* v. 4, no. 8, Aug. 1955, p. 232-238.

Design and operation of welding machines for spot and seam welding. Electronic control methods. Photographs, diagrams. (K3)

166-K. (Czech.) **Butt-Resistance Welding of High Speed Steel.** Boleslav Vrana. *Zvaranie,* v. 4, no. 8, Aug. 1955, p. 241-250.

Causes of defects in butt-resistance welded cutting tools. Describes economical welding using welding press. Diagrams, graphs, micrographs. (K3, TS)

167-K. (Czech.) **Government Decisions Concerning Mechanization in the Machinery Manufacturing Industry and Mechanization in Resistance Welding.** Boleslav Vrana. *Zvaranie,* v. 4, nos. 9-10, Sept. 1955, p. 260-264.

Report on existing and planned expansion of the use of automatic resistance welding equipment of foreign and Czech manufacture. Designs and operation discussed. Diagrams, photograph. (K3)

168-K. (Czech.) **Influence of Hydrogen in Welding of Air-Hardened Low-Alloy Steels.** Karel Mazanec and Karel Pawera. *Zvaranie,* v. 4, nos. 9-10, Sept. 1955, p. 264-269.

Effect of hydrogen on crack sensitivity of base metals welded with unalloyed ferritic-pearlitic coated electrodes. (K1, ST)

169-K. (Czech.) **The Influence of Granulation of Flux Z41 on the Geometrical Size and Quality of Welds.** Zdenek Duben and Jaromir Lukasek. *Zvaranie,* v. 4, nos. 9-10, Sept. 1955, p. 277-283.

Owing to its high manganese content, the flux is suitable for welding most low-carbon and some alloy steels. Three grades of flux are recommended, according to grain size. Tables, graphs, diagrams, photographs. 2 ref. (K1)

170-K. (Czech.) **Contribution to the Technology of Semi-Automatic Welding.** Zdenek Bajer. *Zvaranie,* v. 4, nos. 9-10, Sept. 1955, p. 294-295.

Evaluation of technological properties. Advantages of alternating current over direct current, with respect to electric power consumption, flux and welding wire used, depth of heat-affected zone, weld formation. Tables. (K1)

171-K. (Czech.) **Repairing Cracked Valve and Pump Casings by Welding.** Antonin Kleander. *Zvaranie,* v. 4, nos. 9-10, Sept. 1955, p. 308-315.

Repair methods for sizable cracks in low-alloy or unalloyed steel forgings or castings of large size and subject to high pressures. Weldability, composition and mechanical properties of steels; recommended repair techniques. Tables, diagrams, photographs. (K1, K9, Q general, ST, AY, CN)

172-K. (German and French.) **Gas-Welding.** K. Boeckhaus. *Zeitschrift für Schweisstechnik,* v. 46, no. 1, Jan. 1956, p. 11-17.

Application of welding to cutting, surface treatment and heat treatment of metallic and nonmetallic materials. Joining by hand, welding under pressure, hard surfacing, cladding and soldering. Table, graphs, diagrams, photographs. (To be continued.) (K2, K7)

173-K. (Slovak.) **Problems in the Present State of Resistance Welding.** *Zvaranie,* v. 4, nos. 9-10, Sept. 1955, p. 287-294.

Process and regulation electronic control, resistance welding in aircraft construction, advantages of spot welding, welding of light metals, advantages of three-phase system, types of resistance welding. Tables, photographs, diagrams. 8 ref. (K3, ST, EG-a)

174-K. **The Use of Cold Cathode Counting Tubes for the Control of Resistance Welding.** T. W. Brady. *Electronic Engineering,* v. 28, Feb. 1956, p. 70-74.

A digital system for controlling resistance welding employs valves developed in the last few years. Diagrams, photographs. 1 ref. (K3)

175-K. **Pressure Welding of Metals and Alloys.** R. Narayanan, L. J. Balasundaram and R. C. Deshpande. *Indian Institute of Science, Journal,* v. 38, sec. B, Jan. 1956, p. 14-19 + 2 plates.

Experimental procedure and results of solid phase welding of aluminum to aluminum at 200 to 450° C. and aluminum to 60:40 brass at 400 to 500° C. Graphs, photographs. 15 ref. (K2, Cu, Al)

176-K. **The 37½° Bevel for Pipeline Welding.** R. G. Strong. *Industry & Welding,* v. 29, Feb. 1956, p. 46-48, 51, 115.

Outlines advantages of 37½° over 30° bevel as shown by results obtained in using both types of bevel on 2000 miles of pipeline. Photographs. (K1)

177-K. **How to Speed Production With CO_2 Welding.** *Industry & Welding,* v. 29, Feb. 1956, p. 80-81.

Brief discussion of application of inert gas-shielded arc process using carbon dioxide as a shield in production of refrigerator compressor shells. Problem of leaks due to spatter eliminated by using a short arc length and replacing gas nozzle with a copper tube to bring carbon dioxide to the arc. Photographs. (K1)

178-K. **Techniques for Inert Arc Welded Repair of Aluminum Sand Castings.** E. R. Kellogg. *Industry & Welding,* v. 29, Feb. 1956, p. 125-127.

Method for repairing defects using aluminum welding rod to match composition of castings, thoriated tungsten electrodes and argon shielding gas. After color buffing, welded spots cannot be detected without optical equipment. Photographs. (K1, E11, Al)

179-K. **Brazed Joints. Design Assembly Heating Methods.** A. N. Kugler. *Machine Design,* v. 28, Feb. 23, 1956, p. 116-122.

Successful brazed joints largely depend upon the degree of planning in design, assembling joint members and selecting a suitable heating method. Diagrams, photographs. (K8)

180-K. **Cores & Adhesives for Aluminum Curtain Wall Panels.** J. M. Roehm. *Modern Metals,* v. 12, Feb. 1956, p. 42 + 4 pages.

Comprehensive study of adhesives and core materials used in producing sandwich-type panels. Design criteria. Photographs. (K12, Al)

181-K. **The Brass Takes a Welding Course.** *Steel,* v. 138, Feb. 20, 1956, p. 108-111.

Welding course for management, supervisory personnel and design engineers results in better teamwork, reduced costs, better products. Photograph, diagrams, table. (K general, A3)

182-K. **Filler Metals for Joining.** Orville T. Barnett. *Welding Engineer,* v. 41, Feb. 1956, p. 31-32, 34.

Surveys use of filler metals in arc welding. Photographs, diagram, tables. 3 ref. (K1)

183-K. (Russian.) **Automatic Arc Welding of L62 Brass.** A. A. Alov and V. T. Zolotykh. *Svarochnoe proizvodstvo,* no. 1, Jan. 1956, p. 1-4.

Experiments showed that by welding brass parts with a thickness of 3 to 4 mm., the resulting joints had sufficient mechanical properties at 180° bending; and m1 or m2 electrode copper wire should be used in welding under flux, but for sheet-brass, the boron-silicon flux MaTI-53 is suggested. Table, diagram, micrograph, photographs. (K1, Cu)

184-K. (Russian.) **Intercrystalline Cracks in Welded Joints of Aluminum Alloys.** S. V. Lashko-Avakian, N. F. Lashko and V. V. Orlova. *Svarochnoe proizvodstvo,* Jan. 1956, no. 1, p. 13-18.

The solidified part of metal is subjected to a substantial plastic deformation during crystallization. The upper limit of crystallization interspace, for the alloy system crystallizing with a formation of solid solution and eutectic, has a minimum and a maximum at a eutectic volume of 4 to 6%. Graphs, diagrams, micrographs. 11 ref. (K9, Q24, N12, Al)

L

Cleaning, Coating and Finishing

262-L. **Maintenance Painting Procedures.** A. L. Kimmel. *American Water Works Association, Journal,* v. 48, Jan. 1956, p. 91-94.

Experience, proper surface preparation and correct methods of application and selection of paint are important factors to be considered in maintenance painting. 6 ref. (L26)

263-L. **Coppertone Sinks—How They Are Made at AVCO.** *Ceramic Industry,* v. 66, Feb. 1956, p. 48-49.

Plant produces 3400 to 3600 sinks daily, fabrication being done in company's own press shop. Describes pressing operation, enamel preparation, ground coat spraying and firing, cover coat spraying, highlighting techniques, firing. Photographs. (L27, ST)

264-L. **How Halrick Enamels Aluminum.** *Ceramic Industry,* v. 66, Feb. 1956, p. 55-56.

Notable features are three different cleaning methods used for various types of alloys instead of one set process, with emphasis placed on adequate rinsing. Parts are sprayed with conventional enamel spray gun, then dried by chromolox infrared units before firing in box-type furnace. (L27, Al)

265-L. **Proper Design for Painting.** H. G. Kirtley and W. G. Colter. *Chemical Engineering,* v. 63, Feb. 1956, p. 187-192.

Design factors which affect service life of protective paints in plant equipment and structures; examples of design problems in plants and possible solutions. Photographs, diagram. (L26)

266-L. **A New Method for Assessing the Resistance of Paint Films to Fungal Growth.** W. R. Hindson and J. R. Rischbieth. *Commonwealth of Australia, Dept. of Supply, Defense Standards Laboratories Report* 219, Sept. 1955, 7 p. + 2 plates.

A more severe method of testing the fungal resistance of paints is described. It is recommended that this method replace the one described in the Draft Commonwealth Specification. Table, photographs. 8 ref. (L26, R11)

267-L. **Anti-Corrosive Applications of "Epikote" Resins.** David H. Nicholson. *Corrosion Technology,* v. 3, Jan. 1956, p. 4-7, 18.

Epikote resins are based on two chemicals; epichlorhydrin and diphenylolpropane, derived from petroleum. They have exceptional resistance to chemical action and their superior properties of adhesion, toughness and flexibility make them suitable for a wide range of special and general applications. Photographs, tables. (L26)

268-L. **Boiler Scale Control.** Vernon H. Farthing. *Fuel Efficiency,* v. 4, Dec. 1955, p. 194-195.

"Crustex" descaler dislodges by means of pulses of ultrasonic energy. Its use decreases risk of caustic cracking. Photographs. (L10)

269-L. **Canada's Decorative Finishers for the Toy Trade Use Electro-Formed Masks.** F. D. Johnson. *Industrial Finishing (London),* v. 9, Dec. 1955, p. 259-262.

Electro-formed masks enable toy industry to speed up production by spray painting. Manufacture and use of masks described. Photographs. (L18, L26, Cu, Ag)

270-L. **Metallic Coatings on Non-Metallic Materials. VI. Gold Films.** *Industrial Finishing (London),* v. 9, Dec. 1955, p. 269-270, 272.

Methods for forming gold films on mirrors. (L16, Au)

271-L. **German Finishers Consider the Problems of Copper Anodes for Faultless Electroplating.** H. Bovet. *Industrial Finishing (London),* v. 9, Dec. 1955, p. 278, 280. (From *Pro-Metal,* 1955, no. 43, p. 452-456.)

Previously abstracted from original. See item 280-L, 1955. (L17, Cu)

272-L. **Brass Plating From Cyanide-Free Alkaline Solutions.** S. K. Ray, H. V. K. Udupa and B. B. Dey. *Journal of Scientific & Industrial Research,* v. 14, sec. B, Dec. 1955, p. 652-655.

Cyanide was replaced by alkaline solution of copper sulfate in glycerine and sodium zincate solution. From current density studies, a method was worked out to deposit brass consisting of 70% copper and 30% zinc. Tables, graphs. 13 ref. (L17, Cu)

273-L. **Success in Color Anodizing.** Kim Darby. *Modern Metals,* v. 11, Jan. 1956, p. 74 + 4 pages.

Rapid expansion in this field, new applications in automobile and refrigeration industry and other decorative uses, corrosion resistance properties compared with chromium plating. Describes automatic anodizing system, processes and quality control methods used. Photographs, diagram. (L19, Al)

274-L. **Experiments on Paint Adhesion Under Moist Conditions.** D. M. James. *Oil & Colour Chemists' Association, Journal,* v. 39, Jan. 1956, p. 39-62, Disc. 62-66.

Various systems of primers and finishing were investigated in fresh and salt water. Adhesion is much less affected by salt water. Nature of the primer coat is major factor determining adhesion. Tables, diagrams, photograph, graphs. 7 ref. (L26, R4)

275-L. Automatic Aluminizing of Valves at Pontiac. Ralph H. Eshelman. *Tool Engineer,* v. 36, Feb. 1956, p. 79-84.

Development of successful process for aluminizing intake and exhaust valves to increase resistance to heat oxidation and atmospheric corrosion. Photographs, diagrams, tables. (L16, Al)

276-L. Making Spray Painting Operations Automatic. Eric H. Cocks. *Tool Engineer,* v. 36, Feb. 1956, p. 99-105.

Methods, applications, advantages and equipment necessary for automatic spray painting. Photographs, diagrams. (L26)

277-L. (Czech.) **Pickling of Alloy Steels.** Josef Rones. *Hutnik,* v. 5, no. 8, Aug. 1955, p. 234-237.

Difficulties involved and uneconomical methods that result in loss of steel and pickling solutions. Recommended pickling baths and new patents for pickling alloy steels. Graphs, diagram. 8 ref. (L12, AY)

278-L. (Russian.) **Volume-Weight Method of Determining Thickness of Oxide Film on Electropolished Aluminum.** P. V. Shchigolev. *Zavodskaia laboratoriia,* v. 21, no. 12, 1955, p. 1474-1476.

Determination of weight and thickness of film in relation to length of polishing time. Table. 5 ref. (L13, S14, Al)

279-L. (Russian.) **Problem of Multilayer Chromium Plating.** A. N. Sysoev and N. T. Drobantseva. *Zhurnal prikladnoi khimii,* v. 28, no. 12, Dec. 1955, p. 1308-1313.

Comparion of cohesive strength of deposits when intermediate anodic etching and cathodic polarization are employed. Conditions for obtaining consistent homogeneous cathodic film obtained in pure chromic acid (without SO_4—ions). Colors of films. Film can be used as anticorrosive and decorative coating for copper and steel. Micrographs, tables. 3 ref. (L17, Cr)

280-L. The Development of an Insulating Enamel. Myron J. Conway, Jr. *American Ceramic Society Bulletin,* v. 35, Jan. 1956, p. 6-10.

Experiments carried out in developing glass-bonded vermiculite enamel which gives insulating and sound absorbing properties to metals. From study of various ways of applying enamel, it was concluded that best results were obtained when large vermiculite particles were concentrated at the top and glass concentrated at the bottom. Photographs, graph, tables. (L27)

281-L. A Radioisotope Study of the Nickel Dip. Joseph C. Richmond, Harry B. Kirkpatrick and William N. Harrison. *American Ceramic Society, Journal,* v. 39, Feb. 1956, p. 39-46.

Radio-isotope tracer studies of the deposition of nickel during nickel dipping of steel and of the effect of this nickel deposit on the reduction of cobalt ions to metallic cobalt during enamel firing. Graphs, photographs, tables. 7 ref. (L16, L27, Co, Ni, ST)

282-L. Automatic Plating of Bumpers. *Automation,* v. 3, Feb. 1956, p. 34-37.

System for precleaning, plating, reclaim and rinsing in automobile bumper plant. Photographs. (L17)

283-L. Plastic Coatings—for Corrosion Prevention. G. A. Curson. *Corrosion Prevention and Control,* v. 3, Jan. 1956, p. 30-34.

A tabular guide to types of plastic coatings applicable to the protection against several corrosive agents. Table, photographs. (L26)

284-L. Acid and Alkali Resistant Protective Paints. II. Coatings Based on Epoxide and Other Resins. W. L. Yeo. *Corrosion Prevention and Control,* v. 3, Jan. 1956, p. 35-36.

Types and qualities of paint useful in corrosion protection. (L26)

285-L. Anodization of Lead in Sulfuric Acid. Jeanne Burbank. *Electrochemical Society, Journal,* v. 103, Feb. 1956, p. 87-91.

Diffraction study of anodic corrosion products. Co-ordinated potential-time curves show arrests corresponding to appearance of these compounds. Tables, graphs, diagrams. 14 ref. (L19, Pb)

286-L. Clay-Free Porcelain Enamels. A. L. Friedberg. *Finish,* v. 13, Feb. 1956, p. 44-45, 86.

Tests using colloidal silica powder as suspension agent for several different titania enamels. Table, graph. (L27)

287-L. Lithographing Metal Sheets for Cans. Frank Campbell. *Industrial Finishing,* v. 32, Feb. 1956, p. 32 + 5 pages.

Equipment, materials and methods for mass-production operation. Photographs. (L26)

288-L. Painting Setup at New Electric Products Plants. Walter Rudolph. *Industrial Finishing,* v. 32, Feb. 1956, p. 42-44, 46.

Description of spray booths, degreasing equipment, ovens and other facilities to process diversified line of products. Photographs. (L26)

289-L. Coatings for Vacuum Metallized Plastics. C. C. Barbera. *Industrial Finishing,* v. 32, Feb. 1956, p. 52, 54.

Problems in formulating base coats, selection of solvents, desirable properties of top coats. (L25)

290-L. Painting Pails and Covers Automatically. George E. McMahon. *Industrial Finishing,* v. 32, Feb. 1956, p. 78-80, 82.

Outside of pails are sprayed electrostatically, inside surfaces are sprayed by two extension spray guns operating on the withdrawal stroke only. Photographs. (L26, ST)

291-L. Techniques in Polishing Die-Castings. T. P. Barbicane. *Machinery,* v. 62, Feb. 1956, p. 167-173.

Methods and devices for polishing die cast parts. Diagrams. (L10)

292-L. The Electrodeposition of Tungsten. G. L. Davis and C. H. R. Gentry. *Metallurgia,* v. 53, no. 315, Jan. 1956, p. 3-16.

Experimental data and theoretical aspects of deposition from aqueous solutions and organic solvents, with special attention to deposition from fused salt baths containing borates and tungstic oxide. Micrographs, tables, graphs, diagram. 49 ref. (L17, W)

293-L. Epoxy Coating Safeguards Laboratory Furniture. William A. Poe. *Metal Progress,* v. 69, Feb. 1956, p. 62-65.

Step-by-step coating operations for furniture subjected to hard service conditions. Photographs, table. (L26)

294-L. Conversion Coatings for Cadmium and Zinc. Edward F. Foley, Jr. *Metal Progress,* v. 69, Feb. 1956, p. 86-90.

Economical and versatile finishes for cadmium and zinc-plated parts and zinc-base die castings. With minor modifications in processing conditions, a wide range of surface finishes can be obtained. No expensive equipment is required. Table, photograph. (L14, Cd, Zn)

295-L. Hydrogen Contamination of Titanium Minimized by Modified Descaling Bath. H. L. Alexander, H. H. Farrell and Q. D. Wheatley. *Metal Progress,* v. 69, Feb. 1956, p. 78-80.

Saturation of sodium hydride baths with titanium dioxide minimized hydrogen pick-up. The coarser grades of titanium dioxide should be used and must be added slowly to avoid excessive foaming and gas evolution. Tables, graphs. (L12, Ti)

296-L. The Painting of Structural Steelwork. Third Interim Report. *Paint Technology,* v. 20, Jan. 1956, p. 15-17.

Litharge and lead linoleate have little effect on the life of red oxide-linseed oil primers. Photographs, table. (L26, ST)

297-L. Proposed Substitutes for Nickel Plating. A. Kenneth Graham. *Plating,* v. 43, Feb. 1956, p. 218-220.

Summary of data from 13 companies regarding coatings on ferrous-base metals. Indoor and outdoor applications, durability, properties, rating relative to nickel plating are considered. Tables. (L17, Ni)

298-L. Commercial Anodic Surface Treatments for Aluminum and Its Alloys. Russell V. Vanden Berg. *Plating,* v. 43, Feb. 1956, p. 221-232.

Anodic coatings discussed in regard to historical background, formation of oxide coating, electrolytes, effect of alloy composition, electrobrightening, commercial applications, method of application, testing methods and specifications. Micrographs, tables, graph, photographs, diagram. 40 ref. (L19, Al)

299-L. Plating—Art or Science? A. H. Du Rose. *Plating,* v. 43, Feb. 1956, p. 239-243.

Incomplete knowledge of fundamentals and frequent lack of consistency and reproducibility in the results are major problems in the plating industry. Graphs, tables. (L17)

300-L. Removal of Fire Marks From Sterling Silver. F. A. Mohrnheim. *Plating,* v. 43, Feb. 1956, p. 244-247.

Characteristics and properties of "fire" in sterling silver, methods for the removal of fire marks are compiled and formulated. Micrographs. 7 ref. (L10, L12, L13, Ag)

301-L. The Measurement of Color and Gloss. Richard S. Hunter. *Product Engineering,* v. 27, Feb. 1956, p. 176-182.

Definitions and derivation of gloss and color scales. Performance and limitations of color and gloss instrumentation. Diagrams, graphs, tables. (L general, S15)

302-L. Cathodic Sputtering—an Analysis of the Physical Processes. A. Guentherschulze. *Vacuum,* v. 3, Oct. 1953 (Published Dec. 1955), p. 360-374.

Investigation of mechanism of primary and secondary sputtering with additional consideration of chemical sputtering, engineering problems, gas absorption. Graphs, diagrams, tables. 20 ref. (L25)

303-L. The Effect of the Substrate Temperature on the Condensation Coefficient of Evaporated Antimony, Gold and Silver. F. M. Devienne. *Vacuum,* v. 3, Oct. 1953 (Published Dec. 1955), p. 392-397.

Condensation coefficient was found to decrease with increase in temperature of substrate, especially in antimony. Experimental procedures and additional factors influencing coefficient discussed. Photographs, diagram, tables. 10 ref. (L25, Ag, Au, Sb)

304-L. (Czech.) **Formation of Protective Coatings in Phosphate Bath.** L. Zemene. *Strojirenstvi,* v. 6, no. 12, Dec. 1955, p. 922-926.

Relation of deposition of coating to temperature, solution concentration and phosphatization time. Phosphatization reactions and weight losses of parts being phosphatized. Graphs, tables. 5 ref. (L14)

305-L. (Czech.) **A New Hard-Facing Material, Poldi "Carbodur 1".** Josef Nemec. *Zvaranie,* v. 4, no. 8, Aug. 1955, p. 239-241.

Preparation and properties of high-alloy material for application by flame or arc methods. Micrograph, diagrams. (L24, Fe, Cr, Mn)

306-L. (Hungarian.) **Prevention of Rusting During Transport and Storage.** *Magyar kémikusok lapja,* v. 10, no. 12, Dec. 1955, p. 388-392.

Application and thickness of coating materials, additions and their effects. Laboratory and industrial tests with a new composition "Korrozital K". Tables, graph, photograph. (L26, R10, ST)

307-L. (Russian.) **Kinetics of Formation of Boronized Layer on Iron Alloys.** M. E. Blanter and N. P. Besedin. *Metallovedenie i obrabotka metallov,* no. 6 Dec. 1955, p. 3-9.

Use of powdered amorphous boron, ferroboron, boron carbide and borax to form boron diffusion coatings. Effect of bath composition, temperature, time and alloying elements. Graphs, tables. 6 ref. (L15, B, ST)

308-L. **Unipositive Beryllium as a Product of Anodic Oxidation.** Barbara D. Laughlin, Jacob Kleinberg and Arthur W. Davidson. *American Chemical Society, Journal,* v. 78, Feb. 5, 1956, p. 559-561.

The electrolysis of an aqueous sodium chloride solution between beryllium electrodes in a divided cell results in the anodic conversion of the metal to both the uni and dipositive oxidation states. The dissolution process is accompanied by anodic evolution of hydrogen. Tables. 4 ref. (L19, Be)

309-L. **Latex-Cement Compositions in Corrosion-Resistant Construction.** I. P. B. Cormac. *Corrosion Technology,* v. 3, Feb. 1956, p. 43-46.

Development of combinations of hydraulic cement with aqueous dispersions of various elastomers. Use as coating materials. Photographs. (To be continued.) (L26, ST)

310-L. **The Sodium Hydride Process for Descaling Metals.** N. L. Evans. *Corrosion Technology,* v. 3, Feb. 1956, p. 47-51.

Plant equipment and operation, advantages and applications of the nonelectrolytic sodium hydride process. Photographs, diagram. 1 ref. (L12)

311-L. **Protective Oil Coatings.** K. F. Schiermeier and R. W. Lewis. *Lubrication Engineering,* v. 12, Jan.-Feb. 1956, p. 19-23.

Types of protective films, factors influencing selection of proper type. Basic considerations in the formulation of rust preventives. Table, graph. 1 ref. (L26)

312-L. **Magnesium + Vinyl.** W. deCamp Crater. *Modern Metals,* v. 12, Feb. 1956, p. 50, 52.

Marvibond process gives metal sheet a tough, tight coating of colored or textured plastic. Advantages and applications. Photographs. (L26, Mg, Al, ST)

313-L. **Influence of Pre-Treatment Prior to Phosphating of Steel.** S. Spring and J. C. Lum. *Organic Finishing,* v. 17, Feb. 1956, p. 5-9.

Three characteristics of zinc phosphate coatings were evaluated to determine effectiveness of the various recommended pretreatment: crystal size, coating weight, porosity. Photographs, table, graph. 4 ref. (L14, Zn, Ti, ST)

314-L. **A Survey of Novelty Finishes. IV.** Harry Burrell. *Organic Finishing,* v. 17, Feb. 1956, p. 19-22.

Printing process of artificial wood graining and preparation of the wood, or other materials, prior to graining. Photographs. (To be continued.) (L26)

315-L. **Pickling Processes Reviewed. III. Treating Ferrous Materials.** D. J. Fishlock. *Product Finishing,* v. 9, Jan. 1956, p. 72-85, 124.

Oxide layer formation, descaling mechanism, sulfuric, phosphoric, hydrochloric, oxalic and nitric acid pickling, hydrogen embrittlement, paste pickles, electropolishing, chemical polishing, control and waste disposal. Diagrams, photographs, graphs, table. (To be continued.) (L12, Fe)

316-L. **Plastic Overcoats for Metal.** *Steel,* v. 138, Feb. 20, 1956, p. 114.

Advantages, equipment and applications of "Whirlclad" process for plastic coating of metals. (L26)

317-L. **Continuous Galvanizing Hits Its Stride.** Ernest W. Horvick. *Steel,* v. 138, Feb. 6, 1956, p. 122-123.

Improved ductility of the zinc coating permits heavy forming operations without destroying corrosion-stopping qualities. Continuous process effects large savings and greater market. Photographs. (L16, Q23, Zn, ST)

318-L. **Electroless Nickel Plating Offers Corrosion, Wear Resistance.** *Western Metals,* v. 14, Feb. 1956, p. 64-65.

Process deposits nickel by reducing a salt to metallic nickel, using sodium hypophosphite as the reducing agent. Part is immersed in hot, buffered solution and mechanically agitated. Photographs. (L14, ST, Ni, Al, Cu, Ti)

319-L. **Low Valent Aluminum as a Product of Anodic Oxidation in Aqueous Solution.** Esko Raijola and Arthur W. Davidson. *American Chemical Society, Journal,* v. 78, Feb. 5, 1956, p. 556-559.

In the electrolysis, between an aluminum anode and a platinum cathode, of various aqueous solutions, aluminum dissolves anodically with an initial mean valence number significantly lower than three, and hydrogen is evolved at the anode. These facts may be interpreted in terms of primary anodic oxidation of aluminum partly to the unipositive state. Tables, graph, diagram. 15 ref. (L19, Al, Pt)

320-L. **Good Polish for Aluminum.** *Modern Metals,* v. 12, Feb. 1956, p. 68.

Wax-base polish effectively cleans tarnished, oxidized or weathered aluminum leaving a durable glass-like coating that is highly resistant to all types of tarnish. Photograph. (L12, Al)

321-L. **The Finish That Fits.** *Steel,* v. 138, Feb. 13, 1956, p. 92-94.

There is a wide variety of finishes for stainless steel. Finishing techniques and applications. Photographs, table. (L general, SS)

M

Metallography, Constitution and Primary Structures

119-M. **Foundry Practice. XI. Heat Treatment.** William H. Salmon and Eric N. Simons. *Edgar Allen News,* v. 35, Jan. 1956, p. 14-15.

Examines the crystal structure following heat treatment and its effect on properties of steel castings. Graphs, micrographs. (To be continued.) (M26, J general, CI)

120-M. **Color in Metallography.** P. Levesque and R. Mroczek. *Educational Focus,* v. 26, Feb. 1956, p. 23-27.

Technique for producing consistently good color transparencies. Photographs, table. 4 ref. (M21)

121-M. **The Lithium-Sodium Liquid Metal System.** O. N. Salmon and D. H. Ahmann. *Journal of Physical Chemistry,* v. 60, Jan. 1956, p. 13-14.

By thermal and chemical analysis, critical temperatures and liquid phase compositions were determined. Graph, table. 7 ref. (M24, N12, Li, Na)

122-M. **Radiation Damage in 99.0% Aluminum.** J. L. Klein and W. B. Noak. *Massachusetts Institute of Technology (U. S. Atomic Energy Commission),* MIT-1091, 1952, 14 p.

Internal distortions in cold worked and irradiated 2S aluminum were measured by means of a Fourier analysis of X-ray line shapes; the Fourier coefficients are compared with those of an annealed specimen. Graphs, table. 3 ref. (M26, Al)

123-M. **Diffracted-Beam Monochromatization Techniques in X-Ray Diffractometry.** A. R. Lang. *Review of Scientific Instruments,* v. 27, Jan. 1956, p. 17-25.

Experimental arrangements and discussion of four methods, using curved-crystal focusing monochromators. Diagrams, graphs, photographs, table. 17 ref. (M22)

124-M. (German.) **The Effect of Electric Hot-Topping on the Interior of Heavy Forging Grade Steel Ingots.** Werner Martin and Erhard Thon. *Stahl und Eisen,* v. 75, no. 26, Dec. 29, 1955, p. 1765-1774.

Solidification of heated and unheated 18-ton ingots; effects of heating on segregation; mold design. Tables, graphs, diagrams, photographs. (M28, N12, D9, ST)

125-M. (Russian.) **Study of Intragranular Mosaic Structure of Austenite by Means of the Electron Microscope.** E. I. Kvashnina. *Metallovedenie i obrabotka metallov,* no. 5, Nov. 1955, p. 15-17.

Intragranular microstructure of quenched alloy steel has blocks differently oriented from those in zones along grain boundaries. Table, micrographs. 3 ref. (M26, N8, AY)

126-M. **A Study of the Formvar Replica Process.** A. W. Agar and R. S. M. Revell. *British Journal of Applied Physics,* v. 7, Jan. 1956, p. 17-25.

Shape of the cross section is examined under various conditions as plain replicas, shadowed replicas, and replicas shadowed on the back. Tables, micrographs, diagrams. 15 ref. (M21, CN)

127-M. **The Automatic Recording of Electron Diffraction Patterns Applied to the Study of Evaporated Copper Layers.** R. B. Kehoe, R. C. Newman and D. W. Pashley. *British Journal of Applied Physics,* v. 7, Jan. 1956, p. 29-31.

Describes equipment for successively recording complete electron diffraction patterns after preset time intervals. Diagrams. 10 ref. (M22, L25, Cu)

128-M. **Electrolytic Stream Etching of Germanium.** Miles V. Sullivan and John H. Eigler. *Electrochemical Society, Journal,* v. 103, Feb. 1956, p. 132-134.

Technique for electrolytic etching in a controlled stream of 0.1% potassium hydroxide. A special jig renders masking operations unnecessary. Diagram, graphs, photographs. 6 ref. (M21, Ge)

129-M. Macroetching of Irradiated Uranium. G. R. Mallett *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-39539, Oct. 1955, 6 p.

Electrochemical method, using a hydrochloric-phosphoric acid bath, has been developed which gives a good macro-etch on uranium irradiated up to 1550 MWD/AT. Photographs. 4 ref. (M21, U)

130-M. Plastic Laps for the Preparation of Specimens for Metallographic Examination. V. J. Haddrell, E. C. Sykes and B. W. Mott. *Institute of Metals, Journal*, v. 84, 1955-56, p. 112-114.

Polythene bonded laps can be used to prepare specimens without the need for the reactivation and trueing necessary when wax or lead are used, and are also suitable for attack-polishing when covered with Terylene fabric. Diagram, tables. 5 ref. (M21)

131-M. A Miscibility Gap in the Face-Centered Cubic Phase of the Copper-Nickel-Chromium System. J. L. Meijering, G. W. Rathenau, M. G. van der Steeg and P. B. Braun. *Institute of Metals, Journal*, v. 84, 1955-56, p. 118-120 + 1 plate.

Metallographic and X-ray diffraction study of the system with particular attention to the isothermal section at 930° C. Two face-centered cubic phases are shown to exist in addition to the body-centered cubic phase. Table, diagram, micrographs. 7 ref. (M24, Cu, Ni, Cr)

132-M. Sub-Structures in Ferrite. P. Samuel and A. G. Quarrell. *Iron and Steel Institute, Journal*, v. 182, Jan. 1956, p. 20-30.

Metallographic and X-ray studies on Armco iron and a number of pure iron-oxygen alloys of known oxygen and carbon contents after a variety of heat treatments. These treatments were chosen to reveal the conditions under which alphaveining may be produced or eliminated and also to check some of the conflicting statements made in the literature. Micrographs, graph, table. 53 ref. (M26, Fe)

133-M. X-Ray Diffraction Study of the Nitrides of Uranium. D. A. Vaughan. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 78-79.

Study of the phases present in the region of the diffusion gradient on uranium reacted with nitrogen at several temperatures between 500 and 915° C. X-ray diffraction patterns. 3 ref. (M26, M22, U)

134-M. Electrolytic Polishing of Nodular Cast Iron. R. E. Skoda. *Metal Progress*, v. 69, Feb. 1956, p. 66.

Electropolishing of nodular cast iron in a solution of CrO_3, acetic acid and water is a rapid and easy method of preparing specimens for metallographic examination. Photographs, graph, micrographs. (M21, CI)

135-M. Grain Boundaries. I. Explanation of Microstructures in Terms of Energies. D. McLean. *Metal Treatment and Drop Forging*, v. 23, Jan. 1956, p. 3-10.

Considers the grain-boundary energies, shape of grains and microstructure of the metal which contribute to the explanation of strengthening or embrittling effects of boundaries. Graphs, diagrams, table. 17 ref. (M27)

136-M. Dislocation Densities in Some Annealed and Cold-Worked Metals From Measurements on the X-ray Debye-Scherrer Spectrum. G. K. Williamson and R. E. Smallman. *Philosophical Magazine*, v. 1, 8th ser., no. 1, Jan. 1956, p. 34-46.

Two basic equations are derived for deducing the dislocation density in powdered materials from the particle size and strain breadth measured from the Debye-Scherrer spectrum. Tables. 12 ref. (M26, H11, Cu, Al, W, Mo, Fe)

137-M. Antiferromagnetic Structure of Alpha-Manganese and a Magnetic Structure Study of Beta-Manganese. J. S. Kasper and B. W. Roberts. *Physical Review*, v. 101, ser. 2, Jan. 15, 1956, p. 537-544.

Neutron diffraction data have been obtained at 4.2 and 298° K. for both alpha-manganese and beta-manganese. The pattern of moment alignment in the antiferromagnetic state of alpha-manganese is deduced. Tables, graphs, diagrams. 10 ref. (M26, P16, Mn)

138-M. Angular Dependence of the Characteristic Energy Loss of Electrons Passing Through Metal Foils. Richard A. Ferrell. *Physical Review*, v. 101, ser. 2, Jan. 15, 1956, p. 554-563.

The Bohm-Pines electron plasma theory is employed to give a theoretical interpretation of some previous experimental results on the scattering of 20-kev. electrons by a thin gold foil. Diagrams, graph, table. 21 ref. (M25, P15, Au)

139-M. Structure of the Intermediate State in Superconductors. A. L. Schawlow. *Physical Review*, v. 101, ser. 2, Jan. 15, 1956, p. 573-579.

A niobium powder method has been used to display the arrangement of normal and superconducting domains in the intermediate state of a superconductor. Patterns have been observed on samples of tin, indium, lead, vanadium and tantalum, and have been studied in some detail for tin. Diagrams, table, diffraction patterns, graphs. 16 ref. (M26, P15, Sn, In, Pb, V, Ta)

140-M. A Study of Ferrous Ternary Diagrams in Relation to Magnetic Interactions: The Fe-Ni-Al System. Ulrich Roesler. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 89-91.

Thermodynamic analysis of the shape of the gamma loop in the iron-rich portion of the phase diagram. Graphs, diagrams. 3 ref. (M24, P16, Al, Fe, Ni)

141-M. The Electron Microscopy of Submicron Iron Particles. John H. L. Watson and Michael W. Freeman. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 150-157.

Determination of shape and structure of colloidal alpha iron. Table, micrographs. 2 ref. (M21, H11, Fe)

142-M. (Czech.) **Constitution of Austenitic Mn-Cr and Cr-Ni Steels for High-Temperature Service.** Frantisek Poboril, Miroslav Knotek and Marcela Zezulova. *Hutnické listy*, v. 10, no. 12, Dec. 1955, p. 725-737.

Degree of embrittlement caused by sigma phase precipitation was determined on steels stabilized with tantalum, columbium, titanium or vanadium. The position of the examined steels in the respective ternary diagram was determined by means of derived equations for the calculation of equivalents of the principal alloying elements of both steel categories. Graphs, micrographs, tables. (M24, N7, Q23, AY)

143-M. (Russian.) **Autoradiographic Method, Utilizing Radioactive Isotopes, for Studying Metals and Alloys.** M. A. Studnits and O. T. Maliuchkov. *Metallovedenie i obrabotka metallov*, no. 6, Dec. 1955, p. 15-21.

Distribution of elements in alloys after crystallization, and redistribution after heat treatment. Mechanism of modification of cast iron and cast steel. Micrographs, diagrams. 4 ref. (M23, N8, CI)

144-M. Neutron Diffraction Studies of Hafnium-Hydrogen and Titanium-Hydrogen Systems. S. S. Sidhu, LeRoy Heaton and D. D. Zauberis. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5501, Jan. 1956, 27 p.

Effect of metal-hydrogen bonds on the physical properties of hydrides, such as characteristic temperature and vibration frequency. Evidence and explanation for the embrittlement of metals by hydrogen. Tables, graphs, diagram. 15 ref. (M26, Q23, Hf, Ti)

145-M. System Zirconium-Nitrogen. R. F. Domagala, D. J. McPherson and M. Hansen. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 98-105.

Metallographic analysis of as-cast and annealed specimens of arc-melted alloys, plus a combined X-ray and analytical study of nitrided sponge, yielded the partial zirconium-nitrogen binary phase diagram. Graphs, micrographs, tables. 17 ref. (M24, Zr)

146-M. Thorium - Columbium and Thorium-Titanium Alloy Systems. O. N. Carlson, J. M. Dickinson, H. E. Lunt and H. A. Wilhelm. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 132-136.

On the basis of data obtained from microscopic examination, melting observations, cooling curves, X-ray analyses and resistance measurements, phase diagrams have been proposed for the two systems. Graphs, micrographs, table. 7 ref. (M24, Th, Ti, Cb)

147-M. High Speed Quenching Dilatometer. F. E. Martin and R. H. Raring. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 191-195.

Design and operation of instrument, useful in studying phase transformations in low alloy steels. An electrical micrometer tube is used to measure specimen length. Data for 0.11% and 0.67% C steels given. Micrographs, graphs, photograph, diagrams. 12 ref. (M23, N8, AY)

148-M. Occurrence of Chi Phase in a 16 Pct Cr, 15 Pct Ni, 7 Pct Mn, 6 Pct Mo Alloy. John Birtalan and R. A. Bloom. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 210-211.

Alloy was subjected to electrolytic separation treatment to obtain lattice parameter measurements of the chi phase. Spectrochemical analysis values given. 10 ref. (M26, Cr, Ni, Mn, Mo, Fe)

149-M. Titanium-Rich Corner of the Ti-Al-V System. J. J. Rausch, F. A. Crossley and H. D. Kessler. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 211-214.

The titanium-rich corner studied to determine phase relationships in the temperature interval 600 to 1200° C. Phase diagrams, graphs, table. 4 ref. (M24, Ti, Al, V)

150-M. Intermediate Phases in Binary Systems of Certain Transition Elements. Peter Greenfield and Paul A. Beck. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 265-276.

Thirty binary systems of vanadium and chromium group transition ele-

ments with second and third long period transition elements explored in regard to the intermediate phases formed. Tables. 47 ref. (M24, V, Cr)

151-M. Liquid Emulsion Autoradiography of Metals. Jack C. Bokros and Philip C. Rosenthal. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 286-288.

Autoradiographic technique used to study distribution of carbon-14 in pure iron after various treatments. Autoradiographs. 2 ref. (M23, Fe)

152-M. The Metallographic View. XIX. Metallography of Carburized Cases. H. E. Boyer. *Steel Processing,* v. 42, Feb. 1956, p. 100-101.

Structure studied at magnification of 50 x. Photograph, micrograph. (M27, J28, ST)

N

Transformations and Resulting Structures

113-N. Allotropic Transformations in Titanium, Zirconium, and Uranium Alloys. A. E. Dwight. *Argonne National Laboratory (U. S. Atomic Energy Commission),* AECD-3673, Sept. 1953, 56 p.

Method is developed by which the influence of solute elements on the transformation temperature may be predicted when experimental data are lacking. Examples of applications of the calculated index in resolving conflicting data and estimating unknown phase diagrams. Graphs, table. 88 ref. (N6, Ti, U, Zr)

114-N. The Effect of Growth Conditions Upon the Solidification of a Binary Alloy. W. A. Tiller and J. W. Rutter. *Canadian Journal of Physics,* v. 34, Jan. 1956, p. 96-121 + 4 plates.

Extremely high-purity lead was produced by zone refining and from this material crystals containing known concentrations of tin, gold and silver were grown under a range of well-controlled growth conditions. Mode of solidification investigated by careful study of changes in appearance of the solid-liquid interface with change in growth conditions. Micrographs, graphs, tables, diagrams, photographs. 15 ref. (N12, Sn, Au, Ag, Pb)

115-S. Nucleation Frequencies for the Crystallization of Selenium Glass. W. B. Hillig. *Journal of Physical Chemistry,* v. 60, Jan. 1956, p. 56-58.

Selenium crystallization was studied within temperature range of 60 to 200° C. Nucleation frequency showed no dependence on temperature. Table. 12 ref. (N2, N12, Se)

116-N. The Formation of Austenite in Plain Carbon Steels at High Heating Rates. Robert A. Huggins, Harry Udin and John Wulff. *Welding Journal,* v. 35, Jan. 1956, p. 18S-26S.

Discussion of austenite formation at heating rates of 2000 to 20,000° C. per sec. Experimental procedures, structures and kinetics. Diagrams, micrographs, graphs. 27 ref. (N8, ST)

117-N. (French.) **Structural Transition of Aluminum-Magnesium 7% Alloys by Tempering and Role of Mg_2Si in the Sensitizing to Intercrystalline Corrosion.** Adrian Saulnier. *Revue de l'aluminium,* v. 32, no. 226, Nov., 1955, p. 1011-1014.

Very minute particles of Al_3Mg_2 phase developed during early aging of the alloy at 200° C., coalescing in time to form large rings. Silicon as an impurity, however, forms Mg_2Si with hardening and consequent intercrystalline corrosion. Micrographs, table. (N7, R2, Al, Mg)

118-N. (Russian.) **Kinetics of Changes in Microstructure of Metals and Alloys During Creep in Tension With High-Temperature Heating in Vacuum.** M. G. Lozinskii and E. I. Antipova. *Metallovedenie i obrabotka metallov,* no. 5, Nov., 1955, p. 9-14.

Changes in grain orientation in hypo and hypereutectoid steels and in copper-nickel alloys. Micrographs, diagrams, photograph, graphs. 4 ref. (N8, N5, Q3, AY, Cu, Ni)

119-N. Why Steel Is Heat Treatable. J. McAfee. *Australasian Engineer,* 1955, Dec., p. 54-60; disc., p. 60, 79.

A general account of the changes in structure and properties which take place during the heat treatment of steel, and of basic heat treatment operations. Diagrams, graphs, micrographs. (N6, N8, J general, ST)

120-N. Beta Transformation in Titanium Alloys. F. C. Holden and R. I. Jaffee. *Battelle Memorial Institute, Titanium Metallurgical Laboratory Report No.* 25, Dec. 1955, 46 p.

A literature survey on the four types of beta transformation in alpha-beta titanium alloys. Mechanism and reaction kinetics of such transformations are summarized, particularly as related to heat treatment and thermal stability of alloys. Graphs, micrographs, tables, 6 app. 59 ref. (N6, J general, Ti)

121-N. The Diffusion of Uranium Into Aluminum. T. K. Bierlein and D. R. Green. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission),* HW-38982, Oct. 1955, 23 p.

Methods used and results obtained in a study of the maximum rate of penetration in the temperature range 200 to 390° C. to provide a necessary basis for interpreting the effect of irradiation on diffusion rates. Diagram, graph, photograph, micrographs, table. 6 ref. (N1, Al U)

122-N. On the Recrystallization of Cold-Rolled Commercially Pure Titanium. Ichiji Obinata and Keizo Nishimura. *Institute of Metals, Journal,* v. 84, 1955-56, p. 97-101 +3 plates.

Study of recrystallization process, determination of recrystallization temperature and construction of diagram, based on determinations of grain size after annealing. Graphs, tables, diagrams, micrographs. 10 ref. (N5, J23, Ti)

123-N. The Effect of Temper-Rolling on the Strain-Ageing of Low-Carbon Steel. H. P. Tardif and C. S. Ball. *Iron and Steel Institute, Journal,* v. 182, Jan. 1956, p. 9-19.

The activation energy of the strain-aging process has been measured using the elongation at the yield point to determine the extent of aging. The two methods of prestraining, which were compared, were stretching in tension and temper rolling. The rate of return of the yield-point elongation has been compared with the increase in hardness and yield stress under the same conditions. Further experiments have been made to establish the cause of the retardation of the return of the yield point after temper rolling. Graphs, table. 12 ref. (N7, F23, Q general, ST)

124-N. Reactions Involved in the First Stage Graphitization of Iron-Carbon-Silicon Alloys. W. S. Owen and J. Wilcox. *Iron and Steel Institute, Journal,* v. 182, Jan. 1956, p. 38-43.

The component reactions involved in the isothermal graphitization of a white iron-carbon-silicon alloy. The rate of growth of the graphite and of solution of cementite, the graphite nucleation frequency per unit volume and per unit austenite-cementite interfacial area, and the rate of decrease of the area were measured. The interplay of these effects during the graphitization process is discussed and a growth model is proposed with a diffusion distance which increases as the reaction proceeds. Graphs. 1 ref. (N8, N1, Fe)

125-N. Interaction of Solutes in Liquid and Solid Solution in Iron. E. T. Turkdogan. *Iron and Steel Institute, Journal,* v. 182, Jan. 1956, p. p. 66-73.

A simple measure of interaction is found to be the ratio of the activity coefficient of solute Y in a ternary solution, iron-X-Y, to that in the parent binary solution, iron-Y, at the same activity of Y. Tables, graphs. 18 ref. (N12, N14, P12, Fe)

126-N. Diffusion in Iron-Chromium Alloys. (Digest of "Influence of Chromium on the Self-Diffusion of Iron", by P. L. Gruzin; *Doklady akademii nauk SSSR,* v. 100, 1955, p. 65-67.) *Metal Progress,* v. 69, Feb. 1956, p. 126, 128.

Previously abstracted from original. See item 147-N, 1955. (N1, Fe, Cr)

127-N. Boron in Iron and Steel. G. M. Leak. *Metal Treatment and Drop Forging,* v. 23, Jan. 1956, p. 21-28.

Review of the effect of boron in iron and steel, with particular reference to its influence on hardenability, shows that some fundamental information about the behavior of boron is lacking. Promising theories to explain mechanism of the hardening effect of boron. Graphs, diagrams. 21 ref. (N8 J26, Fe)

128-N. Self-Diffusion of Metals and Associated Phenomena. XI. R. W. Balluffi, F. D. Rosi, and L. L. Seigle. *Sylvania Electric Products Inc. (U. S. Atomic Energy Commission)* ,SEP-153. *Final Progress Report,* Apr. 1954, 9 p.

Structural changes occurring in brass during dezincification. 3 ref. (N1, Cu)

129-N. Silver Migration in Electric Circuits. O. A. Short. *Tele-Tech & Electronic Industries,* v. 15, Feb. 1956, p. 64-65, 110-113.

Conditions under which silver migrates and methods employed to eliminate it. Diagrams, photographs. (N1, T1, Ag)

130-N. Two Level Approach to Cooperative Phenomena. Jerome Rothstein. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 24-37.

A kinetic treatment of order-disorder transitions is applied to ferromagnetism. A quantitative relationship is developed to describe relaxation phenomena in ordered copper-gold and other alloys. Graphs. 20 ref. (N10, N11, P16, Cu, Au)

131-N. Low Temperature Precipitation in Commercial Oriented 3% Silicon Steel. F. S. Gardner. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 100-106.

Mechanism of changes in structure and magnetic properties of transformer steels after prolonged operation at 100 to 200° C. Table, graphs, micrographs. 8 ref. (N7, P16, AY-h)

132-N. Dislocation Movements in a Stress-Relief Anneal and Their Relation to Magnetic Recovery. C. G. Dunn. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 126-130.

Determination of mechanism of relief of stresses with accompanying improvement in magnetic properties. Studies of movement of edge dislocations on slip planes, polygonization and coarsened substructures. Micrographs, graphs, diagram. 17 ref. (N4, M26, J1, AY, Fe)

133-N. Diffusion of Calcium and Silicon in a Lime-Alumina-Silica Slag. Helen Towers and John Chipman. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint*, 1956, Feb., 13 p.

Two methods for radio-active tracer studies of diffusion in liquid slags investigated. Diffusion constants of calcium and silicon at 1430° C. determined by capillary method. Diagrams, graphs, autoradiograph, microphotometer trace. 8 ref. (N1, N14, B21, Si, Al)

134-N. Solubility of Carbon in Thorium. Robert Mickelson and David Peterson. *Ames Laboratory (U. S. Atomic Energy Commission)*, ISC-463, Feb. 1954, 15 p.

Thorium-carbon samples prepared by arc melting sponge thorium with high-purity graphite. X-ray data, hardness readings and metallographic examinations of heat treated specimens were combined to obtain the solubility limits at four temperatures. Micrographs, graphs, tables. (N12, Th)

135-N. Preparation and Inspection of High-Purity Copper Single Crystals. J. H. Wernick and H. M. Davis. *Journal of Applied Physics*, v. 27, Feb. 1956, p. 149-153.

A simple and inexpensive vacuum procedure has been employed to grow copper single crystals by the Bridgman method. Photographs, diagram. 8 ref. (N12, M23, Cu)

136-N. Diffusion and Marker Movements in Beta Brass. Ulf S. Landergren, C. Ernest Birchenall and Robert F. Mehl. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 73-78

Diffusion coefficients and marker movements determined using welded couples, with three concentration ranges at 750° C. and a fourth at 500, 600, 700 and 800° C. Results favored a vacancy diffusion mechanism. Tables, graphs. 15 ref. (N1, Cu, Zn)

137-N. New Intermediate Phase in Burnt Tungsten Steels. Kehsin Kuo. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 97.

New phase lies between a eutectic of austenite and Fe_3W_3C. It can only form directly from the liquid state by drastic quenching and is a ternary phase of iron, tungsten and carbon. Table, micrograph. 6 ref. (N8, AY)

138-N. Heterogeneous Nucleation of the Martensite Transformation. R. E. Cech and D. Turnbull. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 124-132.

Experiments on powders of an iron-nickel alloy show that the martensite transformation appears to start on heterogeneous nucleation sites. The nature of these sites is hypothesized and a mechanism for burst phenomenon is set forth. Diagrams, micrographs, graphs, tables. 19 ref. (N2, N8, Fe, Ni)

139-N. Comparison of Techniques in a Study of Zinc Self-Diffusion. F. E. Jaumot, Jr., and R. L. Smith. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 137-142.

Self-diffusion in zinc has been used as an instrument for comparison of the adsorption and sectioning techniques as a means of studying diffusion. Graphs, tables. 19 ref. (N1, Zn)

140-N. Interaction of Precipitation and Creep in Mg-Al Alloys. C. S. Roberts. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 146-148.

Poor elevated temperature creep resistance results from case of deformation at grain boundaries and the multiplication of these boundaries by discontinuous precipitation. Micrographs, graph. 7 ref. (N7, Q3 Mg Al)

141-N. Occurrence of CsCl-Type Ordered Structures in Certain Binary Systems of Transition Elements. Paul A. Beck, J. B. Darby, Jr., and O. P. Arora. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 148-149.

Iron-vanadium alloys examined but cesium-chloride-type ordering was not definitely established. Ordering of other systems is discussed. Table. 10 ref. (N10, Fe, V)

142-N. Self-Diffusion in Single and Polycrystals of Zinc at Low Temperatures. F. E. Jaumot, Jr., and R. L. Smith. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 164-169.

Anomalous results obtained for single crystal samples indicated that in some cases grain boundary diffusion predominated. Volume diffusion coefficients values for either samples were much larger than expected from high-temperature data. Graphs, tables. 11 ref. (N1, Zn).

143-N. Transformation of the TiO Phase. Chih-Chung Wang and Nicholas J. Grant. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 184-185.

X-ray diffraction studies reveal a transformation taking place in titanium oxide near 925° C. Physical properties before and after are the same. Table, X-ray spectrometer patterns. 2 ref. (N9, Ti)

144-N. Experimental Observations Concerning the Collapse of Dislocation Loops During Annealing. Jack Washburn. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 189-191.

The *c*-axis indentations in zinc crystals were shown to undergo 100% strain recovery on heating. Observations were consistent with a number of predictions of dislocation theory. Micrographs, diagrams. 1 ref. (N4, M26, J23, Zn)

145-N. Diffusion in Liquid Lead. S. J. Rothman and L. D. Hall. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 199-203.

Diffusions of lead and of trace amounts of bismuth in liquid lead studied in the temperature range 606 to 930° K. by the capillary method using radio-active tracers. Tables, diagram, graphs. 23 ref. (N1, N14, Pb, Bi)

146-N. Filtering Apparatus for Study of Liquid-Solid Equilibria in Alloy Systems. L. A. Willey. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 263-264.

Operation and uses of the apparatus. Diagram, graph. 4 ref. (N12, Al)

147-N. Influence of Holes and Electrons on the Solubility of Lithium in Boron-Doped Silicon. Howard Reiss and C. S. Fuller. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers Transactions*, v. 206, Feb. 1956, p. 276-282.

Theoretical and experimental study of those interactions between holes and electrons which influence solubilities of donors and acceptors in semiconductors. Solubility of lithium doped to varying degrees with boron. Graph, diagrams, tables. 12 ref. (N12, Li, B, Si)

148-N. Effect of Stress on the Martensitic Transformation in the Cu-Zn System. E. J. Suoninen, R. M. Genevray and M. B. Bever. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Feb. 1956, p. 283.

Quantitative investigation of effect of tensile stresses on transformation. Thermo-elastic behavior of martensite formed early in the transformation. Graphs. 9 ref. (N9, Cu, Zn)

P

Physical Properties and Test Methods

134-P. The Vapour Pressure of Solid Cadmium. T. A. O'Donnell. *Australian Journal of Chemistry*, v. 8, Nov. 1955, p. 485-492.

The Knudsen method is used to determine the vapor pressure within the range from 200 to 260° C. Design of effusion apparatus. Diagram, graph, tables. 16 ref. (P12, Cd)

135-P. Measurement of the Vapour Pressure of Bismuth by a Radioactive Tracer Technique. T. A. O'Donnell. *Australian Journal of Chemistry*, v. 8, Nov. 1955, p. 493-500.

Measurement in temperature range from 400 to 500° C.; radioactive tracer technique is used to increase the sensitivity of the Knudsen method. Diagram, graph, table. 20 ref. (P12, S19, Bi)

136-P. Magnetic Susceptibility of Low Resistivity *n*-Type Germanium. F. T. Hedgcock. *Canadian Journal of Physics*, v. 34, Jan. 1956, p. 43-49.

Investigation of polycrystalline germanium between room and liquid nitrogen temperatures. Contribution to susceptibility from both free and bound charge carriers varied inversely with temperature. An effective mass for charge carriers found to be 0.16 of the free electron mass. Graphs. 18 ref. (P16, Ge)

137-P. The Thermodynamics of the Liquid Solutions in the Triad Cu-Ag-Au. I. The Cu-Ag System. Russell K. Edwards and James H. Downing. *Journal of Physical Chemistry*, v. 60, Jan. 1956, p. 108-111.

Partial pressures, determined as a function of temperature and composition, were used in study of thermodynamic properties and activities. Table, diagram, graph. 8 ref. (P12, M24, Cu, Ag)

138-P. The Magnetic Susceptibility of Rubidium. K. Venkateswarlu and S. Sriraman. *Journal of Scientific & Industrial Research*, v. 14, sec. B, Dec. 1955, p. 611-613.

Magnetic susceptibility at 30° C. was found using the Curie method, and its variation up to 100° C. observed for different field strengths. Tables, graph. 11 ref. (P16, Rb)

139-P. The Temperature-Resistance Characteristics of Uranium. L. L. Wyman and J. F. Bradley. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-851, Dec. 1952, 21 p.

Temperature-resistance relationships have been established for samples of alpha-rolled uranium; test data show a parallelism with previous dilatation studies on these materials and reflect the effects of the anisotropy of uranium; average physical constants are derived. Graphs, tables. 9 ref.
(P general, U)

140-P. Some Factors in the Resistance of Crystals to Radiation Damage. C. W. Tucker, Jr., and P. Senio. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1301, Mar. 1955, 8 p.

Following factors discussed in determining the radiation stability of a given material: homogeneity of damage; particle size; cleavage or fracture strength; grain boundaries; temperature; bond type. 4 ref.
(P10, M26)

141-P. The Thermal and Electrical Conductivity of Silver-Palladium and Silver-Cadmium Alloys at Low Temperatures. W. R. G. Kemp, P. G. Klemens, A. K. Sreedhar and G. K. White. *Royal Society, Proceedings*, v. 233, ser. A, Jan. 10, 1956, p. 480-493.

Conductivities of many alloys were measured from 2 to 300° K., with consideration of lattice and electronic components and data on electrical resistance. Table, graphs. 29 ref. (P11, P15, Ag, Pd, Cd)

142-P. (German.) **Effect of the Precipitation Phenomena in the Temperature Range of Embrittlement at 475° C. Upon Some Magnetic Properties of Iron-Chromium Alloys.** Ewald Baerlecken and Heinz Fabritius. *Stahl und Eisen*, v. 75, no. 26, Dec. 29, 1955, p. 1774-1784.

Magnetic measurements on 24 to 66% chromium-iron alloys used for embrittlement studies at 475° C. Tables, graphs.
(P16, Q23, N7, Fe, Cr)

143-P. (German.) **Effects of Radiations on Materials.** Wolfgang Riezler. *Stahl und Eisen*, v. 76, no. 1, Jan. 12, 1956, p. 14-17; disc., p. 17-18.

Mechanics of radiation by electrons, gamma-and X-rays, low and fast neutrons, and fast ions; summarizes most important devices for generation of these rays. Effect of radiation on properties of polyethylene, production of Frenkel defects and foreign atoms, and formation of spikes in metallic materials. 4 ref.
(P10, P13)

144-P. (Russian.) **Magnetostriction Theory of Nickel Single Crystals.** N. S. Akulov. *Doklady akademii nauk SSSR*, v. 106, no. 1, Jan. 1, 1956, p. 31-34.

Quantitative explanation of the course of magnetostriction using the conjugated shifting method of calculation for regions of spontaneous magnetization. Graphs, diagram. 5 ref. (P16, Ni)

145-P. Thermal Conductivity and Linear Expansion of the Eutectic Uranium-Chromium Alloy. H. W. Deem, R. A. Winn and C. F. Lucks. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-900, Jan. 1954, 16 p.

As a potential material for use in power reactors, the alloy's thermal expansion is of interest for stress considerations in assembly and operation, and its thermal conductivity is significant for heat transfer reasons. Measurements were made from 20 to 800° C. Tables, graphs. 1 ref.
(P11, T25, U, Cr)

146-P. Specific Heat Of Liquid Metal and Salt Mixtures. T. B. Douglas. *Brookhaven National Laboratory, Division Of Engineering (U. S. Atomic Energy Commission)*, BNL-2446, Dec. 1955, p. 13-20.

Specific heat of several liquids measured and studied in relation to heat transfer. Results and method employed. Tables. (P12)

147-P. The Mass Transfer Properties of Various Metals and Alloys in Liquid Lead. J. V. Cathcart and W. D. Manly. *Corrosion*, v. 12, Feb. 1956, p. 87-91.

Relative resistance to mass transfer in liquid lead of 24 metals and alloys was measured. Tests were performed in small quartz thermal convection loops. The test temperature was about 800° C. with a thermal gradient of 300° C. existing across the loops. Micrographs, diagram, graph. 1 ref. (P10, Pb)

148-P. The Physics of Magnetic Materials. R. M. Bozorth. *Electrical Engineering*, v. 75, Feb. 1956, p. 134-140.

A review of findings in the field of solid state physics on the phenomena of magnetic materials. Describes application of these findings in practical engineering problems. Graphs, diagrams, tables. 15 ref. (P16)

149-P. Measurements of Contact Resistance Between Normal and Superconducting Metals. Fernand Bedard and Hans Meissner. *Physical Review*, v. 101, ser. 2, Jan. 1, 1956, p. 26-30.

The contact resistance between crossed wires of Pb and Sn, Pb and Cu, Sn and Cu, Sn and In, separated by their natural oxide layers, has been measured at constant temperatures as a function of current direction and magnitude. Diagrams, table, graphs. 9 ref.
(P15, Pb, Sn, Cu, In)

150-P. Paramagnetic Effect in Superconductors. II. Further Theoretical Aspects. Hans Meissner. *Physical Review*, v. 101, ser. 2, Jan. 1, 1956, p. 31-36.

Resistance and distribution of mean induction and current density at the point of maximum flux increase. Temperature dependence calculation for apparent relative permeability. Graphs, diagram. 9 ref.
(P16, P15)

151-P. Thermal Magnetoresistance of Zinc at Low Temperatures. Perry B. Alers. *Physical Review*, v. 101, ser. 2, Jan. 1, 1956, p. 41-48.

Effect of low and high magnetic fields on the thermal magnetoresistance of crystals at various orientations and at two different temperatures. Diagrams, graphs, tables. 20 ref. (P16, Zn)

152-P. Interaction of Conduction Electrons and Nuclear Magnetic Moments in Metallic Sodium. T. Kjeldaas, Jr., and W. Kohn. *Physical Review*, v. 101, ser. 2, Jan. 1, 1956, p. 66-67.

The electronic wave function at the Fermi surface of metallic sodium is calculated and its connection with the Knight shift and the paramagnetic susceptibility discussed. 12 ref. (P15, P16, Na)

153-P. Optical Properties of Indium Antimonide in the Region from 20 to 200 Microns. Hiroshi Yoshinaga and Robert A. Oetjen. *Physical Review*, v. 101, ser. 2, Jan. 15, 1956, p. 526-531.

The reflectivity and transmission of crystals (*n*-type) measured between 20 and 200 μ. Graphs, tables. 13 ref. (P17, In, Sb)

154-P. Galvanomagnetic Effects in Bismuth. B. Abeles and S. Meiboom. *Physical Review*, v. 101, ser. 2, Jan. 15, 1956, p. 544-550.

Conductivity, Hall effect and magnetoresistance in single crystals of pure and tin-doped bismuth measured as functions of temperature between 80 and 300° K. and as functions of magnetic field up to 2000 oersted. Graphs, tables. 20 ref.
(P15, P16, Bi)

155-P. Infrared Absorption of Indium Antimonide. Eugene Blount, Joseph Callaway, Morrel Cohen, William Dumke and James Phillips. *Physical Review*, v. 101, ser. 2, Jan. 15, 1956, p. 563-564.

Infrared absorption near the adsorption edge interpreted as the superposition of two indirect transitions requiring phonons of 100° and 30°, the former transition involving the smaller electronic energy gap. Graphs. 15 ref.
(P17, In, Sb)

156-P. Infrared Absorption in *n*-Type Germanium. H. Y. Fan, W. Spitzer and R. J. Collins. *Physical Review*, v. 101, ser. 2, Jan. 15, 1956, p. 566-572.

Theory of absorption by free carriers is given, taking into account the effects of scattering by impurities and by lattice vibrations. Experimental results are reported for *n*-type germanium samples of various carrier and impurity concentrations. Graphs, table. 14 ref.
(P17, P15, Ge)

157-P. Hall Effect in Oriented Single Crystals of *n*-Type Germanium. W. M. Bullis and W. E. Krag. *Physical Review*, v. 101, ser. 2, Jan. 15, 1956, p. 580-584.

Hall measurements have been made on oriented single crystals confirming the variations of the Hall coefficient with the direction and magnitude of the magnetic field, and with the direction of the current, which are predicted by theories based on the eight-ellipsoid model. Graphs. 15 ref. (P15, Ge)

158-P. Application of the Bethe-Weiss Method to Ferromagnetism. J. Samuel Smart. *Physical Review*, v. 101, ser. 2, Jan. 15, 1956, p. 585-591.

Bethe-Weiss theory of ferromagnetism is extended and applied to systems containing two nonequivalent sets of sites for the magnetic atoms. Tables, graphs. 14 ref.
(P16, Fe)

159-P. Magnetic Properties of Nickel Telluride. Enji Uchida and Hisamoto Kondoh. *Physical Society of Japan, Journal*, v. 11, no. 1, Jan. 1956, p. 21-27.

Results of the magnetic characteristics of $NiTe_x$ where x, the molal content of tellurium, is varied over a wide range. Graphs. 12 ref.
(P16, Ni)

160-P. Magnetic and Electrical Properties of Manganese Telluride. Enji Uchida, Hisamoto Kondoh and Nobuo Fukuoka. *Physical Society of Japan, Journal*, v. 11, no. 1, Jan. 1956, p. 27-32.

Reports on the dependence of susceptibility of the antiferromagnetic compound MnTe on temperature. Resistivity, the thermo-emf. and the Hall emf. given as functions of temperature. Graphs, diagram.
(P15, P16, Mn)

161-P. The Properties of Some Reactively Sputtered Metal Oxide Films. L. Holland and G. Siddall. *Vacuum*, v. 3, Oct. 1953 (Published Dec. 1955), p. 375-391.

Metal oxides are used as electrically conductive and optically transparent coatings for glass. Related properties and the preparations of oxide of cadmium, tin, indium, iron, gold and bismuth are discussed. Tables, graphs, micrograph. 31 ref.
(P15, L25, Fe, Au, Cd, Bi, Sn, In)

162-P. Collective Electron Model for Magnetization in Alloys. B. R. Coles and J. E. Goldman. Paper from "Conference on Magnetism and Magnetic Materials." American Institute of Electrical Engineers, p. 22-23.

The electron energy band model of ferromagnetism is applied to quantitatively explain the effect of alloying additions on the magnetic moment of iron. Graphs. 4 ref. (P16, Fe, SG-n)

163-P. The Saturation Magnetic Moments in Fe-Al Alloys. M. T. Pigott. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 39-42.

Prediction of magnetic moments for random and ordered alloys by using a single set of localized moments having both positive and negative values. Diagrams, graphs. 8 ref. (P16, Fe, Al)

164-P. Metallurgy and Magnetic Materials. Joseph F. Libsch and George P. Conard. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 80-88.

Effect of deformation, annealing, grain growth and alloying constituents on magnetic properties of materials prepared by wrought, cast or powder metallurgy techniques. Table, graphs. 37 ref. (P16, Al, Fe, Co)

165-P. The Effect of Plastic and Elastic Stresses on the Losses and the Domain Configurations of Grain Oriented 3% Si-Fe. P. W. Neurath. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 92-99.

Experimental data shows relationships between stresses, 60-watt losses and domain patterns. Micrographs, diagrams, graphs, table. 6 ref. (P16, Fe)

166-P. Magnetostriction of Iron and Some Silicon Iron Alloys in High Fields. B. A. Calhoun and W. J. Carr, Jr. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 107-111.

Measurements of forced linear magnetostriction of single crystals to determine if the strain is a true volume effect and if an anisotropy exists. Graphs, tables. 10 ref. (P16, Fe)

167-P. Some Notes on the Ferromagnetic Properties of Alloys With Superlattice. Hiroshi Sato. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 119-125.

Use of a localized model for each atom in the alloy to interpret anomalies arising from the interplay of magnetic and atomic order. Graphs. 18 ref. (P16, N10)

168-P. Recent Advances in the Field of Permanent Magnets. K. J. Sixtus. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 142-149.

Survey of properties of various classes of magnetic alloys. Graphs, micrographs, diagrams. 29 ref. (P16, SG-n)

169-P. An Approach to Elongated Fine Particle Magnets. I. S. Jacobs and C. P. Bean. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 165-175.

Fine-particle magnets based upon crystal anisotropy are described. Table, graphs. 22 ref. (P16, Fe)

170-P. Permanent-Magnet Properties of Elongated Single-Domain Iron Particles. L. I. Mendelsohn, F. E. Luborsky and T. O. Paine. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 176-183.

Reports permanent-magnet properties derived from the shape anisotropy of substantially elongated single-domain iron particles. Graphs, micrographs, tables. 32 ref. (P16, Fe)

171-P. Observation of the Magnetic Domains and Domain Wall in BiMn by the Kerr Magneto-Optic Effect. B. W. Roberts. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 192-197.

The Kerr effect is operative for very fine particles; each particle is light or dark depending upon orientation and polarity; surface preparation includes a fine mechanical polish, using ethyl alcohol as a lubricant to avoid decomposition with water. Micrographs. 10 ref. (P16, Bi, Mn)

172-P. The Anomalous Behavior of Alnico-V in the Sub-Curie Temperature Region of 1000° F. Through 1450° F. J. R. Hansen. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 198-204.

Data regarding the anomalous behavior of Alnico-V that is not readily explained on the basis of compound precipitation. Graphs, micrographs, tables. 8 ref. (P16, SG-n)

173-P. New Facts Concerning the Permanent Magnet Alloy, Alnico 5. E. A. Nesbitt and H. J. Williams. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 205-209.

Experimental report on the detection of fine precipitated particles by measuring the magnetic torque of various field strengths, and separate effects of shape and crystal anisotropy on coercive force. Graphs, micrographs. 5 ref. (P16, SG-n)

174-P. Relation of D-C Magnetic Properties of Oriented 48% Nickel-Iron to Magnetic Amplifier Performance. C. E. Ward and M. F. Littmann. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 228-235.

Direct current magnetic tests used to investigate material properties of a planned group of cores; the results were studied using standardized cores and carefully calibrated test circuitry. Diagrams, graphs, table. 8 ref. (P16, Fe, Ni)

175-P. Soft Magnetic Materials With Rectangular Hysteresis Loops. N. I. Ananthanarayanan. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 236-246.

Structural conditions necessary to obtain rectangular hysteresis loops and the practical methods of obtaining these structural conditions in polycrystalline materials, with special reference to some of the most widely used materials. Diagram, graphs, micrographs, table. 86 ref. (P16, SG-p)

176-P. Anomalous Rotational Damping in Ferromagnetic Sheets. T. L. Gilbert and J. M. Kelly. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 253-263.

A previously unexplored method is presented for determining the anomalous damping by measuring the torque on a thin ferromagnetic disk in a strong rotating field. Diagrams, graphs, tables. 6 ref. (P16, SG-n)

177-P. Dynamax, a New Crystal and Domain Oriented Magnetic Core Material. G. H. Howe. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 264-272.

Investigation of 65 permalloy (65% nickel-iron) indicates that heat treatment in a magnetic field is more effective on strip of low polycrystalline alignment. Diagrams, graphs, photographs, micrographs, tables. 2 ref. (P16, Ni)

178-P. Magnetic Effects of Compressional Stress at Low Field Intensities. R. E. Fischell. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 315-320.

Toroidal, laminated cores of several important magnetic materials were tested for the low field intensity magnetic properties at compressional stresses ranging from 0 to 500 psi. Diagrams, graphs, photographs, tables. 1 ref. (P16, Q28, SG-n)

179-P. Effect of Temperature on the Permeability and Core Loss of Electrical Steels. J. J. Clark. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 329-333.

Test results obtained on a number of materials over a range of temperatures from −75 to +96° C.; materials tested included magnetic ingot iron, cold rolled low-carbon steel, Hipernik alloy, and a number of silicon steels of low, medium and high silicon content. Graphs, tables. 2 ref. (P16, SG-n)

180-P. Stability Characteristics of Molybdenum Permalloy Powder Cores. C. D. Owens. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 334-339.

Inherent stability characteristics of molybdenum permalloy powder cores and the apparatus design factors which affect the stability considered on basis of experience from telephone applications. Diagrams, graphs, photograph, micrograph. (P16, H general, SG-n, Mo, Ni, Fe)

181-P. Low Temperature Electrical Resistance of Fifteen Commercial Conductors. O. E. Park, M. M. Fulk and M. M. Reynolds. Paper from "Proceedings of the 1954 Cryogenic Engineering Conference". NBS Report 3517, p. 101-102.

Preparation of samples and procedure, results of measurements. Table. 2 ref. (P15)

182-P. Thermal Radiation Absorption by Metals. M. M. Fulk, M. M. Reynolds and O. E. Park. Paper from "Proceedings of the 1954 Cryogenic Engineering Conference". NBS Report 3517, p. 151-157.

Ability of a metal surface to radiate or absorb radiant energy is governed by material and its physical condition. Various metals and surface treatments discussed. Tables, graphs. 1 ref. (P11, P17)

183-P. Thermal Conductivity of Solids at Low Temperatures. R. L. Powell and D. O. Coffin. Paper from "Proceedings of the 1954 Cryogenic Engineering Conference". NBS Report 3517, p. 189-193.

Measurement of thermal conductivity of pure metals, alloys and disordered dielectrics. Results given for a silver solder and a free-cutting copper. Diagrams, graphs, photograph. 1 ref. (P11, Cu, Ag)

184-P. Accurate Measurement of Certain Physical Properties Down to

20° K. Herrick L. Johnston, Robert W. Powers, Howard W. Altman, Thor Rubin and Robert W. Mattox. Paper from "Proceedings of the 1954 Cryogenic Engineering Conference". NBS Report 3517, p. 194-195.

Apparatus designed and measurements carried out for thermal conductivity, thermal expansion and compressibility of solids and condensed gases. Graphs, diagrams. (P11, P10, SS, U, Fe)

185-P. A New Criterion for Superconductivity in Metals. Gerhart Groetzinger, David Kahn and Philip Schwed. Paper from "Proceedings of the 1954 Cryogenic Engineering Conference". NBS Report 3517, p. 196-199.

Criteria proposed by Kikoin and Lasarew, Fröhlich and Bardeen; presents new criterion. Table. 4 ref. (P15)

186-P. (French.) **Research on the Thermo-Electric Properties of Aluminum in Very Thin Sheets.** Jean Savornin. *Métaux, corrosion-industries,* v. 30, no. 363, Nov. 1955, p. 446-449.

The thermo-electric properties of thin sheets of aluminum obtained by evaporation of the metal in vacuum studied in relation to copper and silver. Table, graph. 6 ref. (P15, Cu, Al, Ag)

187-P. (Russian.) **Effect of Radiation on the Physical Properties and Structure of a Solid.** A. I. Zakharov. *Uspekhi fizicheskikh nauk,* v. 57, no. 4, 1955, p. 525-576.

Changes in properties of ordered alloys in resistivity, temperature coefficient, magnetic saturation. Crystal-lattice changes; phase transformations; diffusion in alloys; elastic properties. Effect of radiation on semiconductors. Graphs, tables, diagram. 91 ref.
(P general, N general, Ni)

188-P. (Russian.) **Theory of Magnetic Susceptibility of Metals at Low Temperatures.** I. M. Lifshits and A. M. Kosevich. *Zhurnal eksperimental'noi i teoreticheskoi fiziki,* v. 29, no. 6, 1955, p. 730-742.

Magnetic properties of electrons in metal for given law of dispersion. Energy levels of a quasi-particle with given law of dispersion in a magnetic field; magnetic moment of the gas of such quasi-particles. Periods and amplitudes of oscillation determined by form of Fermi's boundary surface. 8 ref. (P16)

189-P. (Russian.) **DeHaas-Van Alfen Effect in Thin Layers of Metals.** A. M. Kosevich and I. M. Lifshits. *Zhurnal eksperimental'noi i teoreticheskoi fiziki,* v. 29, no. 6, 1955, p. 743-747.

Energy levels of quasi-particle with given law of dispersion in a magnetic field. Oscillating part of magnetic moment of gas of such quasi-particles. Fermi's boundary surface. Diagrams. 2 ref. (P16)

190-P. Electron Ejection From Metals by Ions. H. D. Hagstrum. *Bell Laboratories Record,* v. 34, Feb. 1956, p. 63-67.

The operation of a gas-filled electron tube depends upon the release of electrons from the cold cathode by the action of gaseous ions, providing another means of probing the surface properties of metals and energy levels of electrons in them. Diagrams, graphs, photographs. (P15)

191-P. Electrical Steels. P. H. Estes. *Canadian Mining and Metallurgical Bulletin,* v. 49, no. 526, Feb. 1956, p. 82-86.

Three major trends away from hot rolled sheet materials are given—cold reduced silicon strip, oriented silicon strip and common iron. Graphs. (P15, P16, ST)

192-P. Review of Germanium Surface Phenomena. R. H. Kingston. *Journal of Applied Physics,* v. 27, Feb. 1956, p. 101-114.

Surface behavior as related to diode and transistor technology. The electronic behavior of the bulk semiconductor as influenced by the surface is fairly well understood; major unsolved problems lie in the realm of chemistry and atomic structure. Graphs, table, diagrams. 99 ref. (P13, P15, Ge)

193-P. Effect of Stress on the Expansion Coefficient. A. R. Rosenfield and B. L. Averbach. *Journal of Applied Physics,* v. 27, Feb. 1956, p. 154-156.

The expansion coefficients of specimens under tensile stress and after the stress has been removed have been measured for three steels (0.20,0.40 and 0.80% carbon) and for two types of Invar. Tables, graphs. 6 ref. (P11, Q27, Fe, ST)

194-P. Effect of Quenching on the Resistivity of Au-Cd. M. S. Wechsler and T. A. Read. *Journal of Applied Physics,* v. 27, Feb. 1956, p. 194-195.

Some preliminary experiments on the effect of quenching on the resistivity of gold-cadmium single crystals of nominal compositions 47.5 and 49 atomic-percent cadmium. Graphs. 4 ref. (P15, Au, Cd)

195-P. Thermodynamic Properties of Solid Fe-Au Alloys. L. L. Seigle. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 91-97.

Free energies, heats and entropies of mixing, measured by the galvanic cell method between 800 and 900° C., show a positive deviation from Raoult's law and a large excess entropy of mixing. Graphs. 20 ref. (P12, Fe, Au)

196-P. Effects of Alloying Elements on the Electrical Properties of Manganin-Type Alloys. D. D. Pollock and D. I. Finch. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 203-210.

Study of relationships between the compositions of specially prepared copper-manganese-nickel-iron alloys and their electrical properties at room temperature. Graphs, tables. 16 ref.
(P15, T1, Ca, Mn, Ni, Fe)

197-P. On the Impurity Conduction in Germanium. Yasuo Kanai and Riro Nii. *Physical Society of Japan, Journal,* v. 11, no. 1, Jan. 1956, p. 83-84.

Germanium samples, in which nickel was added as an impurity, have been prepared, and their electrical properties measured from room temperature to liquid air temperature. Graph. 5 ref. (P15, Ge)

198-P. (Italian.) **The Influence of Free Carbon on the Magnetic Properties of Iron and Silicon Iron.** Andrea Ferro and Giorgio Montalenti. *Ricerca scientifica,* v. 25, no. 10, Oct. 1955, p. 2828-2833.

Variations in the magnetic properties of iron and silicon iron caused by a precipitation treatment of carbon always present as a free element in very small amounts in these materials. Graphs. 5 ref. (P16, Fe)

199-P. (Book.) **Conference on Magnetism and Magnetic Materials.** 370 p. 1955. American Institute of Electrical Engineers 33 W. 39th St., New York 18, N. Y. $8.00.

Reports on theory, resonance phenomena, metallurgical and structural factors, apparatus, and components. Pertinent papers are separately abstracted. (P16, SG-n, p)

Q

Mechanical Properties and Test Methods; Deformation

203-Q. Pressure-Cabin Fatigue. P. B. Walker. *Aircraft Engineering,* v. 28, Jan. 1956, p. 11-19.

Stress pattern in a pressure cabin, fatigue loading actions and descriptions of tank testing apparatus developed for the Comet and of the Britannia tank. Photographs, diagrams. (Q7)

204-Q. On the Buckling of Oblique Plates in Shear. W. H. Wittrick. *Aircraft Engineering,* v. 28, Jan. 1956, p. 25-27.

Examination of critical shear stresses in 45° parallelogram plates showed that even for plates of practical proportions, ratio between two critical shear stresses may be of the order of 4 if edges are simply supported. Diagrams, graph, tables. 4 ref. (Q28, Q2)

205-Q. Unique Structural Problems in Supersonic Aircraft Design. F. P. Mitchell. *Aeronautical Engineering Review,* v. 15, Jan. 1956, p. 34-39.

Load distribution, wing shape, internal pressures and landing gear design, as analyzed by the structures engineer in terms of weight. Graphs, diagrams. (Q3, Q7)

206-Q. Bending and Impact Tests of Cast-Iron, Cast-Steel, and Nodular-Iron Valve Bodies. J. O. Jeffrey and R. H. Hanlon. *Mechanical Engineering,* v. 78, Jan. 1956, p. 23-27, 30.

Bending at 900° F. and drop impact tests at 40° F., conducted on standard 6-in. flanged gate valve bodies, indicated that ferritic iron valves possess sufficient shock resistance and ductility to avoid brittle fracture under these conditions. Photographs, micrographs, tables. 11 ref. (Q5, Q6, Q26, CI)

207-Q. The Adhesion of Clean Metals. F. P. Bowden and G. W. Rowe. *Royal Society, Proceedings,* v. 233, ser. A, Jan. 10, 1956, p. 429-442.

Investigation of adhesion between surfaces of hard metals cleaned by heating in a high vacuum. Low initial adhesion is due to released elastic stresses when load is removed. Application of tangential force in addition to load increases adhesion. Diagrams, graphs, table. 14 ref. (Q9, K12)

208-Q. Influence of Grinding Fluids Upon Residual Stresses in Hardened Steel. H. R. Letner. *Steel Processing,* v. 42, Jan. 1956, p. 25-29, 58.

Experiments in which air, two concentrations of rust inhibitor in water, six soluble oils and four straight grinding oils were used to show effect of grinding fluid on residual stress induced by surface grinding. Graphs, table, diagram. 8 ref. (Q25, G18, ST)

209-Q. Hot Cracking of Stainless Steel Weldments. P. P. Puzak, W. R. Apblett and W. S. Pellini. *Welding Journal,* v. 35, Jan. 1956, p. 9S-17S.

Study of weld and base-metal hot cracking in types 347 and 304 stainless steels. Tables, graphs, photographs, diagrams. 3 ref. (Q26, K9, SS)

210-Q. Stresses in Welded Pressure Vessels. W. P. Kerkhof. *Welding Journal,* v. 35, Jan. 1956, p. 41-S-59S.

Factors involved in calculating allowable stresses. Diagrams, graphs, tables. 10 ref. (Q25)

211-Q. Strain Energy Release Rate Determination for Some Perforated Structural Members. Emmet E. Day. *Welding Journal*, v. 35, Jan. 1956, p. 60S-64S.

Cast plastic Cr-39 was used for photo-elastic study of strain distribution. Energy release factors were determined and compared with theoretical values. Graphs, photographs, diagrams, 10 ref. (Q25)

212-Q. Nature of the Damping of Vibrations (in Iron and Steel). V. I. Prosvirin and N. N. Morgunova. *Henry Brutcher Translation No.* 3559, 17 p. (Abridged from *Vestnik mashinostroeniya*, v. 32, no. 5, 1952, p. 53-59.) Henry Brutcher, Altadena, Calif.

Phenomena in cast iron and carbon (0.05 to 0.92%) and austenitic steels under various heat treatments. Tables, graphs. 16 ref. (Q8, CI, AY)

213-Q. Comparison Damping Capacities of Some Steels and Cast Irons. N. N. Morgunova. *Henry Brutcher Translation No.* 3616, 7 p. (Abridged from *Vestnik mashinostroeniya*, v. 32, no. 11, 1952, p. 59-61.) Henry Brutcher, Altadena, Calif.

Relative attenuation of torsional vibration in structural steels and cast irons. Effects of heat treatment. Tables, graphs. 1 ref. (Q8, Q1, CI, Cn, AY)

214-Q. (English.) **Comparative Judgment of Materials in Relation to Their Uses.** H. Odenhausen and G. Zessler. *Acier, Stahl, Steel*, v. 20, no. 12, Dec. 1955, p. 509-515.

Establishes some main groups of judgment criteria and ascertains the result for the most important materials. Tables, graphs, photographs. (Q general, S22, ST)

215-Q. (Russian.) **Residual Stresses After Grinding of Metals.** O. G. Karpinskii and B. M. Levitskii. *Doklady akedemii nauk SSSR*, v. 106, no. 1, Jan. 1, 1956, p. 55-57.

X-ray and optical investigations of stresses of first and second orders after grinding at different speeds and in different directions. Graphs. 8 ref. (Q25, G18)

216-Q. (Russian.) **Destruction by Repeated Loading.** S. I. Ratner. *Doklady akademii nauk SSSR*, v. 106, no. 2, Jan. 11, 1956, p. 246-249.

Two conditions exist in a material during loading: decrease of fracture resistance and increase in resistance to plastic deformation. Table, graphs. 2 ref. (Q24, Q26)

217-Q. (Russian.) **Mechanical Properties of Iodide Titanium.** E. M. Savitskii, M. A. Tylkina and A. N. Turanskaia. *Doklady akademii nauk SSSR*, v. 106, no. 2, Jan. 11, 1956, p. 254-257 + 1 plate.

Strength and plasticity of wires, 3.5 to 7.5 mm. in diameter, at various temperatures and under different systems of stress conditions. Tables, graphs, photographs, micrographs. 10 ref. (Q23, Q25, Ti)

218-Q. (Russian.) **Role of Residual Stresses in Fatigue Strength of Shrink-Fitted Built-Up Rolls.** I. V. Kudriavtsev and N. M. Savvina. *Metallovedenie i obrabotka metallov*, no. 5, Nov., 1955, p. 17-23.

Surface hardening, by shot peening and other methods, to increase fatigue strength of rolls having shrunk-on sleeves. Effect of various heat treatments. Role of compressive stresses. Graphs, tables, diagram. 2 ref. (Q7, Q25, J28, ST)

219-Q. (Russian.) **Residual Stresses in Connection With Case-Hardening by High-Frequency Current.** G. F. Golovin and D. A. Kotsylo. *Metallovedenie i obrabotka metallov*, no. 5, Nov. 1955, p. 28-32.

Profile of hardness in the hardened layer. Effect of tempering variations on distribution of hardness and residual stresses. Graphs, photograph. 1 ref. (Q25, Q29, J28, J29, ST)

220-Q. (Russian.) **Properties of Industrial Forgings of Steel 20KhM.** N. I. Belan, V. V. Novikov and V. M. Kanfor. *Metallovedenie i obrabotka metallov*, no. 5, Nov. 1955, p. 33-41.

Alloy steel forgings, with cross-sections up to 145 mm., have practically no variation in creep limit, strength or hardness throughout the piece. Graphs, tables, diagrams. 5 ref. (Q3, Q23, Q29, F22, AY)

221-Q. (Russian.) **Methods for Studying Wear of Case Hardened Steel Used in Manufacture of Gears.** L. M. Fel'dman and M. A. Balter. *Zavodskaia laboratoriia*, v. 21, no. 12, 1955, p. 1501-1503.

Studies of variation in microhardness during wear. Effect of temperature and contact stresses. Graphs, diagrams, micrograph. (Q9, Q29, ST)

222-Q. (Russian.) **Attachments for Machine IM-12A for Performing Short-Time Hot Tensile and Bending Tests of Metals.** V. A. Kubasov. *Zavodskaia laboratoriia*, v. 21, no. 12, 1955, p. 1506-1507.

Description of bath for heating test specimens, a reverser for high-temperature bending tests, and a pipe-shaped electric heating furnace. Photographs, graph. 1 ref. (Q5, Q27)

223-Q. (Spanish.) **The Problem of Fatigue in Welded Construction.** Z. Garcia Martin. *Ciencia y técnica de la soldadura*, v. 5, no. 27, Nov.-Dec. 1955, p. 1-10.

Study of mechanism and avoidance of fatigue failure. Results of investigation of fatigue resistance of a Spanish structural steel under different circumstances. Diagrams, graphs, table, photographs. (Q7, ST)

224-Q. Experiment and Theory in the Investigation of the Behavior of Structures at High Temperatures. N. J. Hoff. *Aeronautical Engineering Review*, v. 15, Feb. 1956, p. 39-47.

Problems of creep, thermal stresses and buckling in consequence of creep or thermal stresses which arise from aerodynamic heating in the structural components of supersonic aircraft. Diagrams, graphs, photographs. 6 ref. (Q3, Q28)

225-Q. A Bend-Test Method of Determining the Stress Required to Cause Creep in Tension. J. B. Wachtman, Jr., and L. H. Maxwell. *ASTM Bulletin*, no. 211, Jan. 1956, p. 38-39.

Some materials require a rather well-defined stress to cause creep in tension. A method is described which permits the use of bending tests to determine this stress under conditions which make tension testing difficult. Diagrams, graphs. 4 ref. (Q3, Q27, Q5)

226-Q. Tension Testing Apparatus for the Temperature Range of −320° F. to −452° F. E. T. Wessel. *ASTM Bulletin*, no. 211, Jan. 1956, p. 40-46.

A relatively small, simple system economical to operate and capable of testing at loads to 20,000 lb. max. Photographs, table, diagram. 17 ref. (Q27)

227-Q. Relaxation of High-Tensile-Strength Steel Wire for Use in Prestressed Concrete. Garnett McLean and C. P. Siess. *ASTM Bulletin*, no. 211, Jan. 1956, p. 46-52.

Relaxation characteristics were obtained by using resonant frequency measurements to determine stress variation with time. Three types of wire were tested: those straightened after drawing, but not stress-relieved; those both straightened and stress-relieved; and those not straightened, but stress-relieved. Graphs, table, diagram. 10 ref. (Q3, Q25, CN)

228-Q. An Axial Loading Creep Machine. M. H. Jones and W. F. Brown, Jr. *ASTM Bulletin*, no. 211, Jan. 1956, p. 53-59; disc., p. 60.

Factors influencing the eccentricity of loading in tension testing, and a creep machine designed to reduce bending stresses in tension creep to a minimum. Graphs, photographs, diagrams. 4 ref. (Q3)

229-Q. Residual Stresses in Welded Structures and Their Measurement. Hugh Muir and J. S. Hoggart. *Australasian Engineer*, Dec. 1955, p. 46-50.

A review of the causes of residual stresses, the factors affecting their magnitude, the likely effects of these stresses; methods available for measurement of residual stresses in welded structures. Diagrams. 7 ref. (Q25)

230-Q. Effect of Hydrogen on the Properties of Titanium and Titanium Alloys. G. A. Lenning and R. I. Jaffee. *Battelle Memorial Institute, Titanium Metallurgical Laboratory Report No.* 27, Dec. 1955, 84 p.

Surveys available research data and industrial experience on hydrogen effects. Basic considerations in the reactions are examined and correlated with steps in production, fabrication and processing to indicate the sources of hydrogen contamination. Factors affecting hydrogen embrittlement. Graphs, tables, micrographs. 35 ref. (Q general, Ti)

231-Q. The Intergranular Brittleness of Single-Phase Copper-Antimony Alloys. L. M. T. Hopkin. *Institute of Metals, Journal*, v. 84, 1955-56, p. 102-108 + 1 plate.

Impact and tensile tests were made, showing low and high-temperature embrittlement in the presence of equilibrium segregation and ductility decrease with increased antimony content. Yield points and strain aging were considered. Table, graphs, diagram, micrographs. 16 ref. (Q23, Q6, Q27, Cu, Sb)

232-Q. Rotational Slip in Zinc Single Crystals. A. D. Whapham. *Institute of Metals, Journal*, v. 84, 1955-56, p. 109-111 + 2 plates.

Single crystals were deformed by torsion about their trigonal axis and the mechanism of the deformation process investigated. Deformation mechanism was shown to be rotational slip on (0001) plane. Micrographs, photographs. 17 ref. (Q24, Zn)

233-Q. Observations on the Mechanical Properties of Two Age-Hardenable Copper-Aluminum Alloys. J. P. Dennison. *Institute of Metals, Journal*, v. 84, 1955-56, p. 115-117.

Effect of aging, at 400° C., on the mechanical properties of two alloys containing cobalt and cobalt plus nickel. The effect of cold work by cold rolling, with and without subsequent aging. Graphs, table. 2 ref. (Q general, Q24, N7, Cu, Al)

234-Q. The Contraction Ratio for Work-Hardening Materials. A. Shelton and Hugh Ford. *Iron and Steel Institute Journal*, v. 182, Feb. 1956, p. 160-168.

Tensile tests were carried out in the elastic and elastic-plastic regions of strain of a number of commonly used metals to determine the behavior of the lateral-longitudinal strain ratio. Diagrams, tables, photographs, graphs. 7 ref. (Q27, ST, Cu, Al)

235-Q. Approximate Strength of Industrial Gas Turbine Alloys Treated for Optimum Properties; Data Sheet. *Metal Progress*, v. 69, Feb. 1956, p. 80B.

Tensile, stress-rupture, and creep strengths of ten heat resisting alloys at various temperatures. Table. (Q23, Q3, Q4, SG-h)

236-Q. Russian High-Temperature Testing Techniques. (Digest of "Influence of Boundary Zones, Containing Low-Melting Components, on the Results of High-Temperature Testing of Alloys Under Various Conditions of Deformation", by A. A. Bochvar, M. E. Drits and E. S. Kadaner; *Izvestiya akademii nauk S.S.S.R., otdelenie tekhnicheskikh nauk,* no. 2, 1954, p. 42-45.) *Metal Progress,* v. 69, Feb. 1956, p. 106.

Effect of grain-boundary microconstituents on long-time high-temperature hardness and tensile-rupture strength of several magnesium alloys. Table. (Q4, Q29, Mg)

237-Q. Decomposition of Metastable Structures by Plastic Deformation. (Digest of "Effect of the Decomposition of a Solid Solution Produced by Plastic Deformation on the Mechanical Properties of an Aluminum-Copper Alloy", by V. A. Pavlov; *Doklady akademii nauk SSSR,* v. 95, 1954, p. 1201 to 1203.) *Metal Progress,* v. 69, Feb. 1956, p. 160, 162.

Previously abstracted from original. See item 656-Q, 1954. (Q general, Al)

238-Q. Deformation Potential Theory for *n*-Type Ge. William P. Dumke. *Physical Review,* v. 101, ser. 2, Jan. 15, 1956, p. 531-536.

Deformation potential theory reexamined for electrons in germanium to take into account the ellipsoidal nature of the energy surfaces and the effect of shear wave-scattering. The coupling between shears and the conduction band energy minima is calculated from Smith's piezoresistance. Tables. 13 ref. (Q24, P15, Ge)

239-Q. On the Plastic Deformation of α-Brass Single Crystals by Compression. Hiroshi Kimura. *Physical Society of Japan, Journal,* v. 11, no. 1, Jan. 1956, p. 53-57.

Relationship between the crystallographic orientation of specimens and the easy glide examined with alpha-brass single crystals deformed by compression. Micrographic observations performed and discussed. Diagram, graphs, micrographs. 4 ref. (Q24, Q28, M26, Cu)

240-Q. How to Calculate Pipe Stresses. I. How to Use the Tabular Method. K. Hao Hsiao. *Pipe Line Industry,* v. 4, Feb. 1956, p. 20-25.

New tabulation method can save time without sacrificing accuracy in calculating stresses in three-dimensional piping systems. Tables, diagrams. (Q25)

241-Q. Nickel Bronze Powdered Metal Parts. Stanley P. Perry. *Precision Metal Molding,* v. 14, Feb. 1956, p. 63-64.

Tables of mechanical properties of test parts made of powdered nickel bronze. Tables, diagram. (Q general, H general, Cu)

242-Q. Solid-Film Lubricants. Ralph E. Crump. *Product Engineering,* v. 27, Feb. 1956, p. 200-205.

New lubricants offer high load-carrying capacity of boundary lubricants, frictional properties of light oil and are relatively independent of temperature from −100 to 1000° F.; principal limitations are lack of heat dissipation capacity and flushing action. Diagrams, graphs, photographs, table. 7 ref. (Q9)

243-Q. Deformation and Recrystallization of Silicon Iron. George Wiener and Robert Corcoran. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 112-118.

Microscopic and x-ray studies of deformation textures after 75% cold rolling. Micrographs, diagrams, tables. 6 ref. (Q24, N5, Fe-q)

244-Q. Preferred Orientations and Magnetic Properties of Rolled and Annealed Permanent Magnet Alloys. W. R. Hibbard, Jr. Paper from "Conference on Magnetism and Magnetic Materials". American Institute of Electrical Engineers, p. 184-191.

Pole figures, torque curves and coercive force have been determined for the following: Cunife, Cunico, Silmanal, Vicalloy I, Vicalloy II and Heusler's alloy. Diagrams, graphs, tables. 15 ref. (Q24, P16, SG-n)

245-Q. The Mechanical Properties Testing Program at the NBS-AEC Cryogenic Engineering Laboratory. R. H. Kropschot. Paper from "Proceedings of the 1954 Cryogenic Engineering Conference". NBS Report 3517, p. 164-169.

Testing equipment, procedures, results of tests. Table, micrographs, graphs, diagram. (Q27, Q7, Q6)

246-Q. Apparatus for Tensile Testing in the Temperature Range of 4.2 to 300° K. E. T. Wessel. Paper from "Proceedings of the 1954 Cryogenic Engineering Conference". NBS Report 3517, p. 170-178.

Equipment and procedures for both nitrogen and helium systems of testing. Graphs, diagrams. 12 ref. (Q27)

247-Q. The Compressive Strengths of Some Technical Metals Between 4.2° and 300° K. C. A. Swenson. Paper from "Proceedings of the 1954 Cryogenic Engineering Conference". NBS Report 3517, p. 179-182.

Testing apparatus and test results for hot rolled 1020 steel, a pure iron, and several stainless steels. Graphs, diagrams. 8 ref. (Q28, ST, Fe, SS)

248-Q. (Czech.) **Effect of Addition of Molybdenum on the Life of Chilled Cast Iron Rolls for Hot Rolling Thin Steel Sheets.** Maximilian Honzik. *Hutnické listy,* v. 10, no. 12, Dec. 1955, p. 720-725.

Addition of molybdenum over 0.30% produces an increase in resistance to thermal stresses and increased wear resistance of the hardened surface. Tables, graphs. (Q23, T5, CI)

249-Q. (German.) **Effect of Small Degrees of Deformation on the Yield Point of Cold Rolled Low Carbon Strip Steels of Deep-Drawing Quality.** Fritz Fischer, Matthias Nacken and Vincenz Seul. *Stahl und Eisen,* v. 76, no. 2, Jan. 26, 1956, p. 82-90; disc. 90-93.

Materials tested, testing equipment, preparation of test pieces. Effect of different storing periods and of heat treatment after various degrees of temper rolling. Attempts to interpret behavior of yield point after slight degree of temper rolling on basis of the dislocation theory. Graphs, diagrams, table. 28 ref. (Q23, F23, ST)

250-Q. (Japanese.) **A Creep Test on a 12% Cr Heat Resisting Steel.** Takeshi Akutagawa. *Journal of Railway Engineering Research (Japan),* v. 12, no. 24, Dec. 1955, p. 607-613.

Molybdenum, tungsten, vanadium, titanium and columbium studied as alloys of 12% chromium steel. Heat treatment and alloy performances evaluated. Table, graphs, diagrams, photographs. (Q3, J general, SS)

251-Q. (Polish.) **Causes of Fractures or Damage in Rolls in Hot Sheet-Rolling Mills.** Michal Musial. *Wiadomosci hutnicze,* v. 11, no. 12, Dec. 1955, p. 380-385.

Classification of fractures according to position and direction on roll. Considers excessive pressure, fatigue, microstructural changes, surface-layer cracking, defectively made and machined rolls, and casting defects. Diagrams, micrograph. 1 ref. (Q26, Q general, F23, ST)

252-Q. (Russian.) **Long-Time Strength and Creep of Copper M1.** S. K. Maksimov. *Metallovedenie i obrabotka metallov,* no. 6, Dec. 1955, p. 21-24.

Creep strength and plastic properties of copper at high temperatures. Studies of brittle fractures at room temperature. Graphs, tables, photograph. (Q3, Q23, Q26, Cu)

253-Q. (Russian.) **Effect of Electrospark Hardening on Wear Resistance and Fatigue Strength.** G. P. Ivanov and V. P. Savukov. *Metallovedenie i obrabotka metallov,* no. 6, Dec. 1955, p. 52-56.

Effect of electrode material, electrospark methods and previous heat treatment on wear and fatigue strength of steel. Photograph, table, diagrams, graphs. 3 ref. (Q7, Q9, ST)

254-Q. Hydrogen Embrittlement in an Ultra-High-Strength 4340 Steel. E. P. Klier, B. B. Muvdi and G. Sachs. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb. 12 p. + 15 plates.

Hydrogen embrittlement as promoted by copper plating is compared to that developed by cathodic treatment in caustic soda for 4340 steel at selected levels above 200,000 psi. tensile strength. Tables, diagrams, graphs, photographs. 8 ref. (Q23, AY)

255-Q. Stresses in Pressure Vessels. W. P. Kerkhof. *Engineers' Digest,* v. 17, Jan. 1956, p. 24-28. (From *De Ingenieur,* v. 67, no. 45, Nov. 11, 1955, p. 131W-138W; no. 46, Nov. 18, 1955, p. 141W-148W.)

Calculation of allowable stresses with consideration to weld efficiency and stress corrosion. Diagrams, graph, table. 8 ref. (To be continued.) (Q25, R1, ST)

256-Q. Irradiation of Zircaloy-2 Impact Specimens Containing Hydrogen. R. G. Wheeler and W. S. Kelly. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission),* HW-39805, Nov. 2, 1955, 6 p.

Investigation to determine if Zircaloy-2 containing hydrogen in excess of 75 p.p.m. would absorb hydrogen under given conditions of irradiation at same rate as pure Zircaloy-2. Test results given for 18 specimens. Graph, table. 3 ref. (Q6, Zr)

257-Q. Presssure-Testing Cylinder Liners. F. Danson. *Gas and Oil Power,* v. 51, Feb. 1956, p. 44-45.

Design of jig for testing large cylinder liners. Diagrams, photographs. (Q23)

258-Q. Some Mechanical Properties of a Heat-Treated Aluminum-Silicon-Copper-Magnesium Casting Alloy. Harold L. Walker. *Indian Institute of Science, Journal* v. 38, sec. B, Jan. 1956, p. 4-13 + 2 plates.

The mechanical properties of ultimate tensile strength and per cent elongation in 2 in. for an alloy after heat treatment by a solid-solution treatment of heating for 12 hr. at 980° F., followed by quenching for varying times in molten salt baths at temperatures varying from 300 to 400° F., are compared to the same mechanical properties of the alloy after conventional heat treatments. Tables, micrographs. (Q general, J27, Al, Si, Cu, Mg)

259-Q. Autocorrelation Analysis of the Sliding Process. Ernest Rabinowicz. *Journal of Applied Physics,* v. 27. Feb. 1956, p. 131-135.

A simple model of the sliding process is developed in which the junctions are of the same size but have different shear strengths, and, using an artificially obtained friction trace, it is shown that the size of the junctions may be deduced through a simple autocorrelation analysis. Diagrams, graphs. 15 ref. (Q9)

260-Q. Stress Annealing in Copper Films. R. W. Hoffman and H. S. Story. *Journal of Applied Physics,* v. 27, Feb. 1956, p. 193.

Stress annealing measurements were made on a number of copper films ranging in thickness from 900 to 1500 A. Preparation of films and stress testing procedure described. Graph. 7 ref. (Q25, J23, Cu)

261-Q. Preferred Orientations in Rolled and Annealed Titanium. J. H. Keeler and A. H. Geisler. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 80-90.

Preferred orientations determined by Geiger counter spectrometer X-ray diffraction technique. Five annealing textures dependent on temperature range of annealing were found. Results are examined in terms of current theories of recrystallization textures. Diagrams, tables. 27 ref. (Q24, N5, Ti, Zr)

262-Q. Creep-Rupture by Vacancy Condensation. E. S. Machlin. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 106-111.

Growth of pre-existent voids by vacancy condensation is highly probable. A theory of creep-rupture is presented. Tables, graphs. 18 ref. (Q3, M26)

263-Q. Tensile Deformation of Germanium Single Crystals. R. P. Carreker, Jr. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 111-113.

Six germanium single crystals were tested in tension in the temperature range 550 to 670° C. Plastic extension of 35% was obtained at 670° C. The flow stress of germanium is particularly sensitive to rate of straining. Diagram, graphs, micrograph. 7 ref. (Q27, Ge)

264-Q. Hot-Rolled Textures of Titanium Alloys. C. J. McHargue, J. R. Holland and J. P. Hammond. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 113-114.

Comparison of hot and cold rolled textures of binary alloys containing 3.8% aluminum, 14.75% zirconium and 15.4% tantalum. Table, diagrams. 5 ref. (Q24, F23, Ti)

265-Q. Mechanism of Plastic Flow in Titanium at Low and High Temperatures. F. D. Rosi, F. C. Perkins and L. L. Seigle. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 115-122.

Investigation of slip and twinning behavior in coarse-grained specimens or arc-melted sponge and iodide titanium extended to −196, 500 and 800° C. Micrographs, diagrams, tables. 30 ref. (Q24, Ti)

266-Q. Preferred Orientations in a Meta-Stable Body-Centered-Cubic Zr-Cb Alloy. J. H. Keeler. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956 p. 122-123.

Deformation and annealing textures are similar to those of other body-centered-cubic metals. Preferred orientation of the hexagonal-close packed phase is related to the parent body-centered-cubic phase by the Burgers relationship. Diagrams. 9 ref. (Q24, N5, Zr, Cb)

267-Q. Strain Rate Effects in Tungsten. James H. Bechtold. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 142-146.

Mechanical properties of annealed tungsten are very sensitive to strain rate in the range from 175 to 350° C. Strain rate exponent is twelve times that of steel. Zener-Hollomon parameter can be used to correlate effects of strain rate and temperature. Graphs, tables. 8 ref. (Q23, W)

268-Q. Effects of Oxygen, Nitrogen, and Carbon on the Ductility of Cast Molybdenum. L. E. Olds and G. W. P. Rengstorff. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 150-155.

Molybdenum ingots containing controlled amounts of a single impurity element were tested for ductility at various temperatures and the relationship between plastic behavior and chemical composition determined. Micrographs, tables, graphs. 13 ref. (Q23, Mo)

269-Q. Creep of Copper at Intermediate Temperatures. T. E. Tietz and J. E. Dorn. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 156-162.

Creep, at intermediate temperatures, obeys the same general laws as creep at high temperatures, but the activation differs in that it is less than that for self-diffusion. Graphs, photographs. 18 ref. (Q3, Cu)

270-Q. Mechanism of Grain Boundary Sliding. H. C. Chang and Nicholas J. Grant. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 169-170.

Evidence that sliding takes place by a bulk shear process. Micrographs, diagram. 9 ref. (Q24, N3, Al, Zn)

271-Q. Tensile Deformation on Molybdenum as a Function of Temperature and Strain Rate. R. P. Carreker, Jr., and R. W. Guard. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 178-184.

True stress-true strain data for nominally pure molybdenum as well as data on yield strength, tensile strength and percentage of elongation as a function of temperature. These were analyzed to determine effect of temperature on flow characteristics. Micrographs, table, diagrams, graphs. 15 ref. (Q27, Mo)

272-Q. Internal Friction in Zirconium. W. J. Bratina and W. C. Winegard. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 186-189.

Internal friction characteristics and temperature dependence of the torsion modulus for iodide zirconium, containing 2.4% hafnium, were investigated by a low frequency pendulum technique. Graphs. 10 ref. (Q22, Zr, Hf)

273-Q. Tensile Creep of High Purity Aluminum. R. W. Guard and W. R. Hibbard, Jr. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956. p. 195-199.

A 99.994% aluminum was tested in creep at a constant stress over a wide range of temperatures and stresses. Graphs, tables. 16 ref. (Q3, Al)

274-Q. Effect of Cooling Rate on Hardness of Commercial Titanium Alloys. Howard Martens. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 288.

Variation of Knoop hardness with cooling rates determined for three alloys. Graphs. 1 ref. (Q29, Ti)

275-Q. Zirconium Fatigue Tests. W. P. Wallace and R. H. Wallace. *Light Metal Age,* v. 14, Feb. 1956, p. 24-25.

Rotating beam fatigue tests on zircaloy 2 and flexure fatigue tests on sheet crystal bar zirconium. Graphs, diagram, micrograph. (Q7, Zr)

276-Q. Wear Studies With Radioactive Gears. V. N. Borsoff. *Lubrication Engineering,* v. 12, Jan.-Feb., 1956, p. 24-27; disc., 27-28.

Radio-active techniques used to detect and measure gear wear, revealing three types: scoring, abrasion and chemical corrosion. Wear behavior of various lubricants; metal transfer studies. Diagram, photograph, graphs, radiographs. 1 ref. (Q9, R1)

277-Q. A Study of Fretting Wear in Mineral Oil. D. Godfrey. *Lubrication Engineering,* v. 12, Jan.-Feb., 1956. p. 37-41; disc., p. 41-42.

Factors involved in lubricated fretting determined by experiments in mineral oil under carefully controlled conditions. Tests with initially unlubricated specimens show marked effect of humidity. Graphs, diagrams, table. 6 ref. (Q9)

278-Q. A Study of the Sliding of Metals, With Particular Reference to Atmosphere. L. F. Coffin, Jr. *Lubrication Engineering,* v. 12, Jan.-Feb., 1956, p. 50-58; disc., p. 58-59.

Comparative friction behavior of 75 couples and the role of atmosphere in the sliding process. Alloying ability serves as a qualitative criterion for local seizure and surface damage. Graphs, micrographs, tables, diagram. 14 ref. (Q9)

279-Q. The Tensile Properties of Single Crystals of High-Purity Iron at Temperatures From 100 to −253° C. N. P. Allen, B. E. Hopkins, and J. E. McLennan. *Royal Society, Proceedings,* v. 234, ser. A, Feb. 7, 1956, p. 221-246 + 1 plate.

Deformation and fracture characteristics of single crystals of high-purity iron of various orientations when tested in tension at temperatures from 100 to −253° C. Graphs, diagrams, tables, micrographs. 23 ref. (Q27, Fe)

280-Q. What to Do About Sucker Rod Failures. A. A. Hardy. *World Oil,* v. 142, Feb. 1956, p. 129-132.

Improved field techniques and thread design resulting in close fit of the threaded connections should minimize fatigue failures. Table, diagrams, photograph. 6 ref. (Q7, ST)

281-Q. (German.) Contribution to Measurement of Elastic Modulus and Attenuation of Sintered Materials. R. Palme and W. Scheiber. *Planseeberichte für Pulvermetallurgie,* v. 3, no. 3, Dec. 1955, p. 87-95.

Improved arrangement for E-modulus determination on samples of alloyed and unalloyed sinter-iron. Tables, graphs. 8 ref. (Q21, H15, Fe)

282-Q. (Russian.) High-Strength Cast-Iron as a Substitute for Steel in the

Manufacture of Certain Cast Parts of Peat Machines. B. T. Kozhevnikov. *Torfianaia promyshlennost',* v. 32, no. 8, 1955, p. 21-22.

Yield strength, hardness and other properties of high-strength cast-iron specimens without heat treatment and with variations of heat treatments. Tables, photographs, micrographs. (Q23, Q29, T29, CI-c)

283-Q. (Book.) **Elevated Temperature Properties of Carbon Steels.** Ward F. Simmons and Howard C. Cross. 63 p. 1955. American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa.

Graphical summary of data. Graphs, tables. (Q general, CN)

R

Corrosion

121-R. Corrosion Problems in Small Heating Boilers. H. F. Hinst. *American Water Works Association, Journal,* v. 48, Jan. 1956, p. 11-18.

Causes and prevention of corrosion in low-pressure heating boilers. Graphs, photographs, micrographs. (R4)

122-R. Corrosion of Brass by Chloramine. T. E. Larson, R. M. King and L. Henley. *American Water Works Association, Journal,* v. 48, Jan. 1956, p. 84-90.

Faucet seats of Monel metal or electrolytically silver-plated brass gave good service, resisting corrosion by chloramine in the water supply. Tables. 5 ref. (R4, Cu, Ni)

123-R. Sulphur Dew-Point Corrosion in Exhaust Gases. R. L. Coit. *ASME, Transactions,* v. 78, Jan. 1956, p. 89-94.

Corrosion can be limited by using corrosion-resistant alloys, using low-sulfur fuels, and by keeping surface temperatures above the acid-water dew point. No available coating materials adequately protect heat exchanger surfaces or compressor blades at low temperatures. Diagram, graphs, photographs, tables. 7 ref. (R9, SG-g)

124-R. Corrosion of Thorium and Thorium Binary Alloys in Distilled Water at 100 and 200° C. W. E. Berry, H. A. Pray and R. S. Peoples. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-951, Sept. 29, 1954, 17 p.

Study to determine if alloy additions might improve the corrosion resistance of thorium in distilled water. Unalloyed Ames thorium possessed excellent corrosion resistance in boiling distilled water. Thorium alloyed with zirconium was equally resistant. Graphs, tables. 15 ref. (R4, Th)

125-R. Corrosion Work by British Railways Research Department. W. J. Hair. *Corrosion Technology,* v. 3, Jan. 1956, p. 8-11.

How some of the problems of corrosion which constantly confront the railways are dealt with. Photographs. (R3)

126-R. Economic Cathodic Protection. Benson G. Brand. *Corrosion Technology,* v. 3, Jan. 1956, p. 12-14.

Use of organic coatings in conjunction with cathodic protection is presented as an effective and economical method of preventing corrosion. Photograph. (R10, L26)

127-R. The Mechanism of the Inhibition of Corrosion by the Pertechnetate Ion. II. The Reversibility of the Inhibiting Mechanism. III. Studies on the Perrhenate Ion. G. H. Cartledge. *Journal of Physical Chemistry,* v. 60, Jan. 1956, p. 28-36.

Inhibited state is labile with respect to concentrations of pertechnetate ion and other constituents of the solution. Perrhenate ion differs radically from pertechnetate ion in its effect on corrosion. Graphs, diagram. 39 ref. (R10, Fe, Tc, Re)

128-R. Mass Transfer of Foreign Elements From Zirconium During High-Temperature Water Corrosion. L. M. Litz, S. A. Ring, W. R. Balkwell and R. D. Nethaway. *Livermore Research Laboratory (U. S. Atomic Energy Commission),* LRL-76, Jan. 1954, 19 p.

Mass transfer of niobium, zirconium, yttrium, strontium, rubidium, selenium, arsenic and germanium from zirconium metal foils was followed during water corrosion of the zirconium at 264, 280 and 300° C. using radio-active tracers of these elements. Diagram, graphs, tables. 1 ref. (R4, Zr)

129-R. Corrosion Resistance of Aluminum Alloys. *National Bureau of Standards, Technical News Bulletin,* v. 40, Jan. 1956, p. 13-15.

Report on 20-year exposure tests in inland and marine atmospheres with various aluminum alloys and protective coatings for the alloys. Photographs, table, graph. 1 ref. (R3, L general, Al)

130-R. (French.) **Practical Aspects of the Fight Against Corrosion.** Strebelle and Stassin. *Centre Belge d'Etude et de Documentation des Eaux, Bulletin mensuel,* nos. 59-60, Nov.-Dec. 1955, p. 292-299.

Investigates corrosion of traveling gantry cranes, and the explosion of a drying machine, in a sugar refinery, due to corrosion. Photographs, micrographs. (R general)

131-R. (Russian.) **Passivation Rate and Potential of Alloy Kh28T3 in Solutions of Sulfuric Acid.** E. I. Litvinova. *Zhurnal prikladnoi khimii,* v. 28, no. 12, Dec. 1955, p. 1285-1290.

Passivation is characterized by chemical stability and remains true with chlorine and copper ions present. Role of titanium, and its effect on action of oxygen, and of smoothness of finish in spontaneous passivation. Effect of solution concentration on passivation rate. Graphs, diagram. 17 ref. (R10, AY)

132-R. (Russian.) **Classification of Corrosion Inhibitors for Metals.** I. N. Putilova and L. G. Gindin. *Zhurnal prikladnoi Khimii,* v. 28, no. 12, Dec. 1955, p. 1298-1301.

Inhibitors, immunizers, passivators and their effect on corrosion processes. Graphs, table. 13 ref. (R10)

133-R. (Russian.) **Problems of Investigating Corrosion of Sintered Iron Products.** I. V. Krotov. *Zhurnal prikladnoi khimii,* v. 28, no. 12, Dec. 1955, p. 1302-1307.

Corrosion testing difficulties caused by nonhomogeneity and porosity. Quantitative determination of rust by cathodic removal in a 2% solution of sulfuric acid. Diagrams. 4 ref. (R11, Fe)

134-R. Heat Transfer and Corrosion Tests for a Sodium-Cooled Fast Breeder Reactor. R. H. Jones and R. E. Lee. *Brookhaven National Laboratory, Division of Engineering (U. S. Atomic Energy Commission),* BNL-2446, Dec. 1955, p. 156-167.

Testing of fuel cladding materials in the form of thin-walled tubing. Diagrams, graph, micrographs, photograph, table. (R6, Na)

135-R. Corrosion Control in Oil and Gas Producing Equipment. J. L. Gattenmeyer, F. W. Hewes and W. H. Seager. *Canadian Mining and Metallurgical Bulletin,* v. 49, no. 525, Jan. 1956, p. 31-36.

Reviews occurrence of corrosion in gas and oil equipment, describes mechanism of corrosion. Methods for preventing, detecting and mitigating corrosion. Diagrams, photograph, table. (R7, R10)

136-R. Selective Corrosion of Delta Ferrite in Cast Stainless Steel. J. M. Bialosky. *Corrosion,* v. 12, Feb. 1956, p. 59.

Reports localized corrosion of delta ferrite formed at high temperature in cast stainless steel. Table, photograph, micrograph. (R7, SS)

137-R. A Study of Protective Criteria on a Pipe Section in a Uniform Environment. L. P. Sudrabin. *Corrosion,* v. 12, Feb. 1956, p. 60-66.

Effect of the reference electrode location upon the meaning of the pipe to reference electrode potential demonstrated by use of a model pipe section. Known anodic areas of representative shape and position are established on iron pipe by coupling high-purity zinc plates through measuring circuits. Diagrams, tables, graph. 16 ref. (R10, Fe, Zn)

138-R. Internal Casing Corrosion in Sour Oil Wells. J. A. Caldwell and M. L. Lytle. *Corrosion,* v. 12, Feb. 1956, p. 67-70.

Indicates need for low-cost method of reducing internal casing corrosion. Results of laboratory and field tests of paraffin-oil and oil-inhibitor mixtures. Tables, diagrams. (R7)

139-R. The Determination of the Effect of a New Grass Killer on Application Equipment. J. A. Kelly, W. J. Falkenstein and J. P. Carr. *Corrosion,* v. 12, Feb. 1956, p. 79-83.

Laboratory tests have been conducted to determine the possible corrosive effect of aqueous solutions of Dalapon sodium salt (sodium 2,2-dichloropropionate) on the metals present in typical agricultural field sprayers. Tables, photographs. 4 ref. (R5)

140-R. The Conductometric Method Applied to the High Temperature Oxidation of Iron. George C. Fryburg. *Corrosion,* v. 12, Feb. 1956, p. 84-86.

The conductometric method is used to study the oxidation of pure iron in the region of 600° C. Iron ribbons of known thickness were used in the tests and the conductance of the central portion of the specimens measured by the potentiometer method. A constant current of 50 milliamp., small enough to prevent heating even in vacuum, was used. An analytical method of measuring the amount of unoxidized iron remaining in specimens is described briefly. Graph, tables. 8 ref. (R2, Fe)

141-R. Corrosion of Stainless Steel in Ferric Chloride Solution. H. A. Liebhafsky and A. E. Newkirk. *Corrosion,* v. 12, Feb. 1956, p. 92-98.

Induction - period experiments, done with the aid of a microbalance, show that corrosion begins within one minute after a clean dry coupon is immersed in ferric chloride solution. It has been demonstrated that measurements of corrosion rate in this system are simple and relatively reproducible. Extension of these measurements should yield valuable fundamental information about this corrosion process. Tables, graphs, diagrams, radiographs. 1 ref. (R5, R11, SS)

142-R. The Influence of Nitrogen-Containing Organic Inhibitors on the

Electrode Potential of Steel in Sulfuric Acid. R. N. Ride. *Electrochemical Society, Journal,* v. 103, Feb. 1956, p. 98-107.

Corrosion inhibition studied by observing electrode potentials and corrosion rates for 13 organic compounds. A revised theory of inhibition proposed. Diagram, graphs. 35 ref. (R5, R10, ST)

143-R. Oxidation of Tungsten. Watt W. Webb, John T. Norton and Carl Wagner. *Electrochemical Society, Journal,* v 103, Feb. 1956, p. 107-111.

Investigation in the 700 to 1000° C. range, covering wide time span, shows that oxidation initially follows the parabolic rate law, eventually changing to the linear. An over-all rate equation is calculated. Micrographs, table, graphs. 20 ref. (R2, W)

144-R. Oxidation Studies in Metal-Carbon Systems. Watt W. Webb, John T. Norton and Carl Wagner. *Electrochemical Society, Journal,* v. 103, Feb. 1956, p. 112-117.

General analysis of oxidation characteristics of alloys containing carbon or carbides. Data on nickel, tungsten, manganese, and titanium-carbon systems. Graphs. 21 ref. (R2, Ni, W, Mn, Ti)

145-R. Thermodynamics of the Oxidation of Chromium. J. N. Ramsey, D. Caplan and A. A. Burr. *Electrochemical Society, Journal,* v. 103, Feb. 1956, p. 135-138.

Microbalance technique used to determine dissociation pressure of chromium oxide over 598 to 1154° C. temperature range. Free energy and enthalpy of oxide formation are calculated. Graph, tables, diagram. 27 ref. (R2, P12, Cr)

146-R. Mathematical Studies on Galvanic Corrosion. V. Calculation of the Average Value of the Corrosion Current Parameter. J. T. Waber, John Morrissey and John Ruth. *Electrochemical Society, Journal,* v. 103, Feb. 1956, p. 138-147.

Mathematical analysis of mean current density for one general and two limiting ratios of electrode and corrodent dimensions, the electrodes consisting of long strips arranged alternately in a common plane. Graphs. 9 ref. (R1)

147-R. Corrosion and Cathodic Protection in Kuwait. J. S. Gerrard. *Institution of Electrical Engineers, Journal,* v. 2, Jan. 1956, p. 2-6.

Principles and methods of cathodic protection against corrosion and measures taken to protect oil installations. Diagrams, photographs, graph. (R7, R10)

148-R. Corrosion of Iron by Oxygen-Contaminated Sodium. G. W. Horsley. *Iron and Steel Institute, Journal,* v. 182, Jan. 1956, p. 43-48.

Study of the interaction of iron with oxygen-contaminated sodium suggests that the corrosion associated with the presence of oxygen in sodium is caused by the formation of a stable double oxide (Na_4O_2). FeO. Tables, micrographs, diagram, X-ray powder photographs. 5 ref. (R6, Fe)

149-R. The Stress-Corrosion Cracking of Austenitic Stainless Steels. I. Mechanism of the Process in Hot Magnesium Chloride Solutions. T. P. Hoar and J. G. Hines. *Iron and Steel Institute, Journal,* v. 182, Feb. 1956, p. 124-143.

Several types of stainless steel wires based on 18% chromium, 8% nickel, stressed in tension, were exposed to 42% aqueous magnesium chloride solution at 135 to 154° C. Corrosion potential and extension were measured. Diagrams, micrographs, tables, graphs. 33 ref. (R1, R5, SS)

150-R. Effects of Sulphate-Chloride Mixtures in Fuel-Ash Corrosion of Steels and High-Nickel Alloys. H. T. Shirley. *Iron and Steel Institute, Journal,* v. 182, Feb. 1956, p. 144-153.

Effect of composition and temperature on various heat resisting materials studied for a range of alkali and calcium sulfate-chloride mixtures. Micrographic characteristics of the attack. Photograph, micrographs, tables. 5 ref. (R6, ST, Ni)

151-R. Cathodic Tank Protection—5 Years Later. R. D. Yingling. *Oil and Gas Journal,* v. 54, Feb. 20, 1956, p. 113-114.

Construction, operating details, experience with anode installation on tanks handling corrosive brines. Diagrams, photographs. (R10)

152-R. Return Lines Failing? Identify the Cause Before Prescribing Treatment. Joseph R. Coursault. *Power Engineering,* v. 60, Feb. 1956, p. 66-67.

Illustrates characteristic types of corrosion, in return lines of boiler systems, due to oxygen and carbon dioxide. Photographs, graph. (R4)

153-R. (Italian.) **Interpretation of the Operation of Inhibitors in the Vapor Phase by Observing Their Behavior at Various Temperatures.** C. Bighi and G. Mantovani. *Metallurgia Italiana,* v. 47, no. 11, Nov. 1955, p. 505-510.

Tests of action of various inhibitors against corrosion by sulfuric dioxide. Photographs. 28 ref. (R10)

154-R. (Norwegian.) **Cavitation.** Ingvar Eggestad and Carsten D. Lovstad. *Teknisk ukeblad,* v. 103, no. 5, Feb. 2, 1956, p. 83-92.

Investigation on steel and nonferrous metals, factors contributing to cavitation, scale effect, effect of hydrodynamic properties. Graphs, tables. (To be continued.) (R2, ST, EG-a)

155-R. (Russian.) **Cavitation Decay on Powerful Hydroturbine Blades.** I. R. Krianin. *Energomashinostroenie,* no. 3, Dec. 1955, p. 14-18.

Influence of material and certain construction factors on intensity of cavitating decay of blades. The main cause of decay is the presence of bolt holes. Diagrams, photographs. 5 ref. (R2)

156-R. (Russian.) **Determination of Cavitation by Means of Brittle Coatings.** E. V. Trifonov and V. I. Dumov. *Energomashinostroenie,* no. 1, Oct. 1955, p. 25-26.

Composition and application technology for varnish coatings. Use in study of cavitation in centrifugal pumps. Causes of cavitation. Photographs, graphs. 4 ref. (R2, S13)

157-R. (Russian.) **Effect of External Current and Cathode Polarization by Protectors on Increase of Fatigue Strength During Corrosion.** L. A. Glikman and L. A. Suprun. *Metallovedenie i obrabotka metallov,* no. 6, Dec. 1955, p. 10-15.

Fatigue curves for carbon-steel test specimens in air and salt solution with and without anodes of zinc-magnesium alloy. Effect of density of cathode current on corrosion-fatigue strength. Table, graphs, diagrams. 9 ref. (R1, R10, CN)

158-R. (Slovak.) **First Conference on Corrosion and Protection of Buildings.** Bohumil Zitnansky. *Zvaranie,* v. 4, nos. 9-10, Sept. 1955, p. 296-299.

Oscillography in studying corrosion, mechanism of corrosion, surface treatment, coatings and other anticorrosion measures. (R general, L general, ST)

159-R. Corrosion Research Laboratories—8: Massachusetts Institute of Technology. Herbert H. Uhlig. *Corrosion Technology,* v. 3, Feb. 1956, p. 36-41, 58.

Description and background of laboratory and examples of recent and current research. Photographs. 55 ref. (R11, A9)

160-R. The Water Engineer and Cathodic Protection. K. A. Spencer. *Institution of Water Engineers, Journal,* v. 10, Feb. 1956, p. 51-76 + 3 plates; disc., p. 76-103.

Deals with bituminous-type coatings and cathodic protection for the exterior of buried metal pipelines, with special reference to their technical and economic advantages. Tables, photographs, graphs, diagrams. 10 ref. (R10, L26)

161-R. Atmospheric Corrosion by Nuclei. R. St. J. Preston and B. Sanyal. *Journal of Applied Chemistry,* v. 6, Jan. 1956, p. 26-44.

Experimental study of the mechanism of filiform corrosion, a type of metal corrosion in which narrow filaments grow from nuclei. Graphs, micrographs, tables. 13 ref. (R1, R3)

162-R. Search For Oxidation-Resistant Alloys of Molybdenum. G. W. P. Rengstorff. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Feb. 1956, p. 171-176.

In an effort to find an oxidation-resistant alloy of molybdenum, binary and ternary alloys containing aluminum, chromium, cobalt, iron, nickel, silicon, titanium, tungsten, vanadium and zirconium were screened. Fourteen other alloying additions also tested. Many of the alloys were more oxidation-resistant than molybdenum, but none were entirely satisfactory. Tables, graphs. 10 ref. (R2, Mo)

163-R. The Life of Pressure Vessels. Sydney D. Scorer, *Machinery Lloyd (Overseas Ed.)* v. 28, Jan. 21, 1956, p. 76-78.

An indirect method of measuring corrosion in pressure vessels and predicting remaining useful life. Diagrams, graph. (R5, R6, R7)

164-R. Watch Minor Constituents for Corrosion. E. V. Kunkel. *Oil and Gas Journal,* v. 54, Feb. 27, 1956, p. 126-127.

Deals primarily with mixtures of acetic acid, formic acid and formaldehyde, and mixtures of these with mineral acids such as sulfuric, sulfurous, phosphoric and toluene sulfonic and air and oxidizing agents such as sodium dichromate. Photograph, tables. 5 ref. (R5, R7, R1)

165-R. Cathodic Protection in Action. J. P. Barrett and E. D. Gould. *World Oil,* v. 142, Mar. 1956, p. 149-153.

Cathodic protection today includes method of determining the need for cathodic protection, current requirements for its application, results of protection of casing and cost of the process. Photograph, diagrams, graphs. 4 ref. (R10)

166-R. Application of Organic Inhibitors in Water-Flooding. J. B. Robinson. *World Oil,* v. 142, Feb. 1956, p. 156, 159-160, 162.

A method for successful treating with water soluble, semipolar, organic corrosion inhibitors. Examples of their use in three water-flood systems. Tables, diagrams. 1 ref. (R10)

167-R. How to Get the Most From Your Inhibitor. W. C. Koger. *World Oil,* v. 142, Mar. 1956, p. 167 + 4 pages.

Tests indicate an oil insoluble inhibitor, heavier than oil, can be used to inhibit high working fluid

wells without a large volume of flush. Photograph, graphs. (R10)

168-R. The Behavior of Materials in Aggressive Liquid Metals. David H. Gurinsky. Paper from "Nuclear Metallurgy". IMD Special Report Series No. 2. American Institute of Mining and Metallurgical Engineers, Inc. p. 5-20.

Available information on the corrosive attack of mercury and molten lead and bismuth on common construction materials. Graphs, diagrams, tables. 18 ref.
(R6, Hg, Pb, Bi)

169-R. Behavior of Materials in Nonaggressive Liquid Metals. Edwin G. Brush and Robert F. Koenig. Paper from "Nuclear Metallurgy". IMD Special Report Series No. 2. American Institute of Mining and Metallurgical Engineers, Inc. p. 21-32.

Nonaggressive liquid metals which are of greatest interest for nuclear power plants—sodium and sodium-potassium alloys. Graphs, tables, micrographs. 13 ref. (R6, Na, K)

170-R. Corrosion of Materials in Fused Hydroxides. G. P. Smith. Paper from "Nuclear Metallurgy". IMD Special Report Series No. 2. American Institute of Mining and Metallurgical Engineers, Inc. p. 71-94.

Some of the fused alkali metal hydroxides are of potential interest in reactor technology, both as coolants and as moderators. This review is concerned with the kinds of corrosion phenomena which have been observed in ceramics and in metals. Micrographs, photographs. 50 ref. (R6, Ni, Na, K)

171-R. (Hungarian.) **Laboratory Investigation of the Corrosive Effect of Various Types of Soils. I. Denison-Cell Investigations.** Mihaly Solti and Jozsef Horvath. *Magyar kémiai folyoirat,* v. 61, no. 12, Dec. 1955, p. 427-437.

Corrosivity of nine different types of soils investigated with steel electrodes in a modified Denison cell. Tables, graphs, micrographs, diagrams. 18 ref. (R8)

S

Inspection and Control

122-S. Ultrasonic Testing of Small-Diameter Tubing With Automatic Recording Equipment. W. L. Fleischmann and H. A. F. Rocha. *ASME, Transactions,* v. 78, Jan. 1956, p. 211-215; disc. p. 215-216.

Delayed shear wave search unit enables ultrasonic testing of small object, while automatic recording eliminates human variables. Photographs, graphs, diagrams. 3 ref.
(S13, SS)

123-S. Instruments as Applied to Product Improvement in Steel Plant Furnaces. J. W. Percy. *Industrial Heating,* v. 23, Jan. 1956, p. 87 + 5 pages.

Some applications of instruments for temperature and combustion control. Diagrams.
(S16, S19, D general, ST)

124-S. Standards for Die Casting Practice. E. N. Field. *Machinery (London),* v. 87, Dec. 30, 1955, p. 1533-1540.

Design aspects, dimensional tolerances, product standards and effect of die temperature on casting dimensions in accordance with the British Standard Code. Tables, graphs.
(S22, E13, Zn)

125-S. Electron Bombardment Furnace Temperature Controller. W. A. Rocco and G. W. Sears. *Review of Scientific Instruments,* v. 27, Jan. 1956, p. 1-2.

Apparatus, control circuit and performance of temperature controller using high-gain servo amplifier system to control bombardment current. Diagrams. (S16)

126-S. Automatic Heat Control Problems of Gas-Fired Industrial Furnaces Analyzed. L. Lawther, *Steel Processing,* v. 42, Jan. 1956, p. 33-35.

Effect of thermocouple construction and location on measuring time lags and thermal inertia of the furnace. Diagrams, graphs.
(S16, J general)

127-S. How to Use Optical Tooling Methods. Earle B. Brown. *Tool Engineer,* v. 36, Feb. 1956, p. 93-98.

Advantages of new technique for accurate measurements are shown by description of its use in constructing an aircraft assembly jig. Photographs, diagrams. (S14)

128-S. Effect of Heat Treating and Mechanical Working of 18-4-1 High-Speed Steel on the Results of Spectro-Analysis. I. A. Grikit. *Henry Brutcher Translation* No. 3617, 4 p. (From *Izvestiya akademii nauk SSSR, seriya fizicheskaya,* v. 19, no. 2, 1955, p. 171-173.) Henry Brutcher, Altadena, Calif.

Differences between chemical analysis and spectroanalysis of cast and forged specimens. Heat treatment has very little influence. Cast specimens have stronger lines for vanadium and tungsten than worked specimens. Table, graphs. (S11, AY)

129-S. Rapid Method for Quantitative Spectro-Analysis of High-Alloy Steels and Alloys. A. G. Komarovskii. *Henry Brutcher Translation No.* 3619, 4 p. (From *Izvestiya akademii nauk SSSR, seriya fizicheskaya,* v. 19, no. 2, 1955, p. 167-169.) Henry Brutcher, Altadena, Calif.

Calibration curves for estimation of elements in complex steels, and tabulated compositions of several alloys. Table, graph. (S11, AY, SG-h)

130-S. Determination of Impurities in Titanium by Spectro-Analysis. Sh. G. Melamed, M. A Notkina and S. M. Solodovnik. *Henry Brutcher Translation No.* 3620, 4 p. (From *Izvestiya akademii nauk SSSR, seriya fizicheskaya,* v. 19, no. 2, 1955, p. 179-180.) Henry Brutcher, Altadena, Calif.

Three different methods permit determination of phosphorus, silicon, magnesium and calcium. Graph. (S11, Ti)

131-S. (Russian.) **Use of Method of Ion-Exchange Chromatography in Determination of Molybdenum in Steels and Ores.** I. P. Alimarin and A. M. Medvedeva. *Zavodskaia laboratoriia,* v. 21, no. 12, 1955, p. 1416-1418.

Effect of concentration of hydrogen peroxide on sorption of molybdenum in sulfuric acid medium. Graph, tables. 11 ref. (S11, Mo, ST)

132-S. (Russian.) **Ultrasonic Inspection of Size of Graphitic Inclusions in Gray Cast Iron.** N. V. Khimchenko and V. N. Prikhod'ko. *Zavodskaia laboratoriia,* v. 21, no. 12, 1955, p. 1468-1471.

Determination of length of graphite flakes in gray cast iron of pearlite-ferrite type. Table, graphs, micrographs, 1 ref. (S13, M23, CI)

133-S. Separation of Rare Earths From Thorium Nitrate. M. W. Lerner and G. J. Petretic. *Analytical Chemistry,* v. 28, Feb. 1956, p. 227-229.

With 90% recovery, thorium is extracted with dibutoxy tetraethylene glycol, and the residual thorium and other impurities with 8-quinolinol-chloroform. Tables. 13 ref.
(S11, EG-g)

134-S. Titrimetric Determination of Zirconium in Magnesium Alloys. Philip J. Elving and Edward C. Olson. *Analytical Chemistry,* v. 28, Feb. 1956, p. 251-252.

Titrimetric determination, using cupferron solution and amperemetric equivalence point detection, provides a rapid, simple and accurate supplement to colorimetric and gravimetric methods. Table. 5 ref.
(S11, Zr, Mg)

135-S. Laboratory Tests for Predicting the Behavior of Metals. C. E. Homer. *Birmingham Metallurgical Society, Journal,* v. 35, Dec. 1955, p. 304-321.

Accuracy of small-scale vs. large-scale trials; difficulty of simulating service conditions in the laboratory. Analysis of various laboratory tests to obtain information in corrosion, cracking tendencies, hot and cold workability and other properties. Photographs, graphs. 5 ref.
(S21, Q general)

136-S. Caesium—137 for Industrial Radiography. R. S. Morgan. *British Journal of Applied Physics,* v. 7, Jan. 1956, p. 25-28.

Investigates suitability of cesium-137 as a γ-ray emitter for radiography and indicates its usefulness for steel up to 4 in. Graphs, tables. 10 ref. (S13, Cs)

137-S. Classifying Copper and Its Alloys. *Copper & Brass Bulletin,* 1956, no. 176, Feb., p. 8-9.

Table of copper and copper-base metals giving nominal composition in per cent. Table, photograph.
(S22, Cu)

138-S. A Non-Destructive Method for the Determination of Uranium-235 in Uranium Metal Slugs. D. G. Miller. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission),* HW-39969, Oct. 1955, 26 p.

Method, using a gamma scintillation spectrometer, based on a determination of the differential counting rate exhibited by the 0.2 m.e.v. photopeak associated with the decay of uranium-235. Graphs, diagrams, photograph. 4 ref.
(S11, U)

139-S. Strip-Steel Thickness Control. *Instruments and Automation,* v. 29, Jan. 1956. p. 91.

Description and operation of X-ray gage system for five-stand mill. Photographs. (S14, F23, CN)

140-S. Instrumentation for a Continuous Strip Steel Annealing Line. A. B. Chamberlin, Jr. *Instruments and Automation,* v. 29, Feb. 1956, p. 285-287.

Instrumentation includes temperature control of furnace zones, measurement of strip temperature in the various zones, control of the anneal atmosphere, safety features and fuel control. Photographs.
(S16, S19, J23, ST)

141-S. The Steel Industry Has Plans for Multipoint Recorders. J. A. Milnes. *Instruments and Automation,* v.29, Feb. 1956, p. 290-291.

Multipoint recording facilitates interpretation of data and can lead to better production methods. Photographs. (S16, S19, ST)

142-S. Determination of Vanadium in Highly Alloyed Steels. *Iron and Steel Institute Journal,* v. 182, Feb. 1956, p. 156-159.

Standard methods already used for mild steel and ferro-vanadium applied to alloy steels with improvement in endpoint detection. Details of procedure are given. Tables. 4 ref. (S11, V, AY)

143-S. International Standards for Wrought Light Alloys. *Light Metals,* v. 19, Jan. 1956, p. 22-23.

Tables of light alloy standards of

the Canadian Standards Association. Tables. (To be continued.)
(S22, EG-a)

144-S. Why Anti-Friction Bearings Fail. Johnny Riddle. *Machinery,* v. 62, Feb. 1956, p. 155-162.

Illustrated examples of common reasons for bearing failures. Photographs. (S21, Q7, Q26)

145-S. New Nondestructive Test for Magnesium Alloy Castings. G. R. VanDuzee. *Materials & Methods,* v. 43, Jan. 1956, p. 98-99.

Bleed-out penetrant method overcomes many of the disadvantages of fluorescent technique. Photographs. (S13, Mg)

146-S. The Determination of Zinc in Copper Alloys. B. Chew and G. Lindley. *Metallurgia,* v. 53, no. 315, Jan. 1956, p. 45-47.

Chromatographic method for the separation of zinc in the 1 to 40% range from all normal types of copper-base alloy. Separated zinc is determined by titration with disodium ethylene diamine tetra-acetate. Tables. 18 ref.
(S11, Zn, Cu)

147-S. Determination of Nickel, Chromium, and Molybdenum Using the Spekker Absorptiometer. J. Winning and S. Miller. *Metallurgia,* v. 53, no. 315, Jan. 1956, p. 50-52.

Some advantages of this method for determinations in steel are increased speed, reduced cost, and elimination of heavy fumes. Graphs (S11, Ni, Cr, Mo, AY)

148-S. Recent Accidents With Large Forgings. E. E. Thum. *Metal Progress,* v. 69, Feb. 1956, p. 49-57.

Causes of four failures of massive rotor forgings reveals that two were due to unduly high stress concentrations introduced by the design or by a repair, others were due to misinterpreting or minimizing the evidence of internal defects found by ultrasonic inspection. Photographs, micrographs, diagrams, graphs.
(S21, S13, Q25, ST)

149-S. Service Failures of Aluminum Die-Casting Dies. G. A. Roberts and A. H. Grobe. *Metal Progress,* v. 69, Feb. 1956, p. 58-61.

The three most common types of failures of aluminum die-casting dies are heat checking, pitting and impingement soldering. Causes of each are investigated. Photographs, micrographs. (S21, E13, TS)

150-S. How Statistical Techniques Solve Metalworking Problems. I. Chester R. Smith. *Metal Progress,* v. 69, Feb. 1956, p. 81-86.

Both time and money can be saved by using statistical techniques to analyze and minimize the necessary experimental data. Two examples of the techniques illustrate how the best methods of processing titanium were selected with a minimum of expense. Tables. (S12, Ti)

151-S. Determination of Aluminum in Presence of Fluoride, Zirconium, and Uranium. Bernice E. Paige, Maxine C. Elliott and James E. Rein. *Phillips Petroleum Co., Idaho Operations Office U. S. Atomic Energy Commission,* IDO-14357, Nov. 1955, 9 p.

A convenient and reliable method which can be made without sample transfers. Table. 6 ref.
(S11, Al)

152-S. Analytical Determination of Trace Constituents in Metal Finishing Effluents. XI. The Determination of Nitrate-Nitrite Nitrogen in Effluents. Earl J. Serfass and Ralph F. Muraca. *Plating,* v. 43, Feb. 1956, p. 233-234.

Procedure involves removal of ammonia from the sample, reduction of the nitrate and nitrite content to ammonia by aluminum, distillation of the ammonia, and determination of the ammonia content of the distillate in the usual manner with Nessler's reagent. Table.
(S11, A8)

153-S. Quality Control of Investment Castings. II Charles Yaker. *Precision Metal Molding,* v. 14, Feb. 1956, p. 55-56, 81.

Major phases in setting up production that meets quality control.
(S12, E15)

154-S. (French.) **Experimentation on Rolling Stock. Relationship Between Test and Regular Service.** L. Gaspard. *Métaux corrosion-industries,* v. 30, no. 363, Nov. 1955, p. 426-439.

Static, compression, shock and vibration tests made on rolling stock; relationship between results of tests and behavior of equipment in service. Photographs, diagrams. (S21)

155-S. (Russian.) **Determination of Hydrogen in Certain Metals by the Isotopic Balance Method.** A. N. Zaidel' and A. A. Petrov. *Zhurnal tekhnicheskoi fiziki,* v. 25, no. 14, 1955, p. 2571-2573.

Ratios of solubilities for isotopes in metals at high temperatures in gaseous phase; comparison of isotopic with chemical analysis data. Tables. 5 ref.
(S11, Zn, Fe, Ni, Cr)

156-S. (Slovak.) **Some Methods of Following Heat Transformations in the Zone of Automatic Submerged-Arc Welds.** Andrej Havalda. *Zvaranie,* v. 4, no. 8, Aug. 1955, p. 226-231.

Advantages and disadvantages of various methods of measuring temperatures in welds and adjacent zones. Description of method comprising rotating contactor connecting an oscillograph with individual thermocouples. Photographs, diagrams, graphs. (S16, K1)

157-S. Electrical Control for the Processing of Transformer Core Steel. E. F. Boening and John Kostelac. *Blast Furnace and Steel Plant,* v. 44, Feb. 1956, p. 199-207.

Detailed description of control features at every step in the processing lines. Photographs, diagrams.
(S18, F23, SG-p)

158-S. Investigations Into the Accuracy of Ball-Bearing Components. A. Kohaut. *Engineers' Digest,* v. 17, Jan. 1956, p. 9-11. (From *Werkstattstechnik und Maschinenbau,* v. 45, no. 10, Oct. 1955, p. 510-513.)

An interference microscope was used for accurate surface investigation of balls. Defects due to shape, assembly and corrosion. Photographs, micrographs. (S15, R1)

159-S. Titanium, Analysis of Impurities. Sam Tour and Henry Suss. *Light Metal Age,* v. 14, Feb. 1956, p. 16-20.

The wet chemical and chlorimetric methods of analyzing titanium for various elements. Photographs. 11 ref. (S11, Ti)

160-S. What Non-Destructive Testing Can Do for You. *Modern Castings,* v. 29, Feb. 1956, p. 35-37.

Nondestructive inspection of castings, properties measured by nondestructive tests, flow recognized through nondestructive testing. Tables. 4 ref. (S13)

161-S. Comparator Specimens Assure Good Finishes. John W. Sawyer. *Steel,* v. 138, Feb. 20, 1956, p. 112-113.

Roughness-comparator specimens for surface finishes of machined parts are proving valuable in production. Manufacturers are listed and their products described. Photographs. (S15)

162-S. Temperature Control of Heat Treating Furnaces. I-II. R. M. Sills. *Steel,* v. 138, Feb. 13, 1956, p. 108-110, 112; Feb. 20, 1956, p. 135-136, 138-139.

Importance of automatic regulation of work temperature is emphasized, and various types of measuring devices are discussed. Data on thermocouples includes composition, characteristics, location, accuracy and temperature range. Graphs, tables, photographs, diagrams.
(S16, J general)

163-S. Rapid Test for Checking Pickling Rinse Waters. Isidore Geld. *Wire and Wire Products,* v. 31, Feb. 1956, p. 200, 236.

O-phenathroline ferrous complex indicator and ceric sulfate solution in normal ferric acid are used in quick and simple test for excessive impurities. 1 ref.
(S11, L12, ST, Fe)

164-S. (German.) **Carbon in Non-Ferrous Metals. II. Carbon in Aluminum.** Joseph Fischer and Walter Schmidt. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 9, no. 1, Jan. 1956, p. 25-28.

Determination of carbon by combustion method in wet oxygen flow at 1050 to 1100° C., with addition of equal weight of copper and 1/10 of its weight of lead and tin. Graphs. 9 ref. (S11, Al)

T

Applications of Metals in Equipment

80-T. Ferrous Materials in Marine Engineering. S. F. Dorey. *Alloy Metals Review,* v. 8, Dec. 1955, p. 2-7.

Alloy steels and cast irons as applied to shafting, reduction gearing, turbines, steam plant and propellers. Tables. (T22, CI, ST)

81-T. Use of Sodium and of Sodium-Potassium Alloy as a Heat-Transfer Medium. II. W. B. Hall and T. I. M. Crofts. *Engineer,* v. 201, Jan. 27, 1956, p. 128-130.

Design of various parts of liquid metal circulating systems. Apparatus for heat-transfer measurement and for cavitation study. Diagrams, graphs. 12 ref.
(T25, EG-e)

82-T. The Future Use Pattern for Titanium. B. S. Mesick. *Journal of Metals,* v. 8, Jan. 1956, p. 42-46; disc. 46-48.

Factors which will influence future of titanium industry, possible applications in addition to aircraft parts, economic factors, properties. Tables, graphs, photograph. 7 ref.
(T general, Ti)

83-T. Jet and Rocket Applications of the New Metals. II. G. D. Johnson. *Journal of Space Flight,* v. 8, Jan. 1956, p.1-6.

Properties, advantages and disadvantages of molybdenum and its alloys, behavior and applications of various refractory oxides and cermets, properties and possible applications of the reactor metals, zirconium, vanadium, hafnium and gadolinium.
(T24, T25, Mo, Zr, V, Hf, Gd)

84-T. The Manufacture of Watch Springs. *Machinery (London),* v. 87, Dec. 30, 1955, p. 1508-1517.

Machinery, materials and methods for production and testing of watch springs and catch pieces for the springs. Photographs.
(T9, CN-s)

85-T. How Chrysler Uses Light Metals. M. F. Garwood and F. H. Mason. *Modern Metals,* v. 11, Jan. 1956, p. 33 + 4 pages.

Advantages of aluminum and magnesium, such as availability, savings due to elimination of many machining operations and higher machining rate; decorative applications and design problems. Photographs, graph. (T21, Al, Mg)

86-T. Magnesium Alloys in the German Volkswagen. Ludwig C. Boehner. Paper from "The User Speaks About Magnesium". Magnesium Association, 6 p. + 3 plates.

Advantages of using magnesium castings in engine, rear axle and transmission assembly; details of design and production of these castings. Tables, photographs. (T21, E general, Mg)

87-T. Magnesium Design Promotes Radar Portability. Paul W. Peay. Paper from "The User Speaks About Magnesium". Magnesium Association, 6 p. + 2 plates.

Recommendations regarding the manufacture of portable radar from magnesium. Specifications relative to deflection, rigidity, strength, galvanic corrosion, sharp corners, notch effects and stress concentrations due to changes in section, and drilled holes. Tables, photographs. (T1, Mg)

88-T. Magnesium Sets New Travel Style. Louis R. Degen. Paper from "The User Speaks About Magnesium". Magnesium Association, 6 p. + 2 plates.

Reviews development and use of magnesium and plastic to manufacture luggage, with some details relative to the process used. Photographs. (T10, Mg)

89-T. Magnesium Tooling—Aid to Production. Thor H. Bahrman. Paper from "The User Speaks About Magnesium". Magnesium Association, 6 p. + 4 plates.

Primary considerations that led to the selection of magnesium for tooling were weight, machinability, weldability, high coefficient of expansion and cost. Photographs. (T5, G1, Mg)

90-T. Use of HK31 Magnesium-Thorium Alloy for Ramjet Engine Construction. Alan V. Levy. Paper from "The User Speaks About Magnesium". Magnesium Association, 15 pages + 8 pages.

For the ever-increasing speed demands placed on piloted and pilotless aircraft, a magnesium-base alloy has been developed which has attractive properties to the designer concerned with 500-700° F. operation at speeds in excess of Mo = 2·5. It is light, retains high strength and elastic modulus to 600° F. and above, has good creep resistance, and can be heat treated and welded. Tables, graphs, photographs. 5 ref. (T25, Th, Zr, Mg)

91-T. (French.) **Sealed Bags for Packing Made of Aluminum Complexes.** Pierre Prévot. *Revue de l'aluminium,* v. 32, no. 226, Nov. 1955, p. 1025-1031.

Properties and applications of aluminum laminated plastic films as packaging materials. Photographs, tables, diagrams. (T10, L26, Al)

92-T. (Italian.) **Development of Titanium and Applications in Aeronautics.** Riccardo Masaniello Corelli. *Aerotecnica,* v. 35, no. 5, Oct. 1955, p. 235-248.

Recent developments in titanium metallurgy, present and potential uses in structures of airplanes, missiles and aircraft engines. Diagrams, tables, micrographs, photographs. 29 ref. (T24, Ti)

93-T. Selecting Constructional Steels for Aircraft Design. C. L. Hibert. *Aero Digest,* v. 72, Feb. 1956, p. 24-33.

Examination of alloy steels in terms of toughness. Covers plastic deformation, tempering, fatigue limit, heat treatment, carbon effects, design notes. Graphs, tables. (T24, Q general, J general, AY)

94-T. New Carburizing Steels for Critical Gearing. I. R. S. Archer, V. A. Crosby and G. A. Timmons. *Iron Age,* v. 177, Feb. 9, 1956, p. 92-95.

Steels containing molybdenum as principal alloying agent offer top carburizing quality with greater economy and are easy to machine. They can be quenched directly from carburizing temperatures without excessive retained austenite. Diagram, graph, photograph. 3 ref. (T7, J28, TS)

95-T. Magnesium Air Frame. Thomas A. Dickinson. *Light Metals,* v. 19, Jan. 1956, p. 15-17.

Characteristics of first all-magnesium airframe to be given flight tests. Photograph, graphs, diagram, table. (T24, Mg)

96-T. Many Applications for B & P Magnesium Printing Plates in Graphic Arts Field. *Magnesium,* February 1956, p. 6-7.

Hard surface, low cost and weight, and precision manufacturing make magnesium plates desirable for many applications. Photographs. (T9, Mg)

97-T. Present and Future Uses of Scarce Metals. Chester T. Sims. *Materials & Methods,* v. 43, Jan. 1956, p. 80-84.

Physical properties, applications, sources, supply and costs of the transition and precious metals, and semiconductors. Photographs, tables. (T general, EG-c)

98-T. Aluminium Cable Installation. Use of Light Metal for Sheath and Core. *Metallurgia,* v. 53, no. 315, Jan. 1956, p. 18-20.

Details on cables in British extrusion plant include quality and types, economic considerations, distribution layout, installation, joints and terminations, lighting installation. Photographs, table. (T1, Al)

99-T. Forgings for the Motor Industry. A. J. Wyatt. *Metal Treatment and Drop Forging,* v. 23, Jan. 1956, p. 29-36; disc. 36-38.

The quality of drop forgings for the motor industry and the means by which metal economy might be improved from the customers' point of view. Tables, photographs, diagrams. (T21, F22, ST)

100-T. Zinc Die Castings for Marine Hardware. Marvin Perkins. *Precision Metal Molding,* v. 14, Feb. 1956, p. 59.

Chromium plated zinc die castings are adapted to marine applications at lower cost than brass or bronze units. Photographs. (T22, E15, Zn, Cr)

101-T. Fabrication in Electrical Plant Manufacture. R. M. Watts. *Welding and Metal Fabrication,* v. 24, Jan. 1956, p. 2-10.

Growth, steel stockyards, preparation of material for fabrication, storage and handling of prepared parts, assembly and welding, finishing processes, supervision, production, technical control of an English electrical company. Diagrams, table, photographs. (To be continued.) (T1, ST)

102-T. Plastic-Clad Aluminum Makes Lightweight Aircraft Parts. *Western Machinery and Steel World,* v. 47, Feb. 1956, p. 88-89.

Plastic-clad 24S-T4 aluminum is used for hydraulic pistons of shock-absorbing landing gear struts providing a high strength-to-weight ratio as well as prevention of seizing and resistance to scoring. Photographs. (T24, L26, Al)

103-T. (Russian.) **Study of Cast-Iron Parts of Foreign Automobiles.** D. P. Glukhov. *Liteinoe proizvodstvo,* no. 12, Dec. 1955, p. 9-12.

Camshafts, valves, crankshafts, flywheels, pistons and rings of American cars studied for microstructure (graphite form, amount of ferrite, grain size), hardness, and influence of chromium, copper other elements. Table, micrographs. (T21, M27, Q29, CI)

104-T. Liquid-Metal Handling. S. G. Bauer. *Chemical Engineering Progress,* v. 52, Feb. 1956, p. 75F-78F.

Chemical reactivity, leak tightness, pumping, cleaning, and safety are some of the factors to be considered in the use of liquid metals as heat transfer agents. Table, diagrams. (T25)

105-T. Purification of the Rare Gases. D. S. Gibbs, H. J. Svec and R. E. Harrington. *Industrial and Engineering Chemistry,* v. 48, Feb. 1956, p. 289-296.

Fifteen metals and alloys investigated to determine their relative efficacies for removing impurities from a stream of argon or nitrogen. Tables, diagram. 16 ref. (T29, Al, P13, Ba, Ca, CI, Cu, Ce, La, Mg, Th, Ti, U, Zr, Zn)

106-T. Aluminum in Autos. *Light Metal Age,* v. 14, Feb. 1956, p. 21-23.

Survey shows an 18% increase in the use of aluminum in the automotive industry. Tables, photograph. (T21, Al)

107-T. Shell Molded Magnesium Shoe Heels. *Modern Metals,* v. 12, Feb. 1956, p. 35-36, 38.

Development of magnesium heels. Production operation for these stronger, slimmer and cheaper heels. Tables, photographs. (T10, E16, Mg)

108-T. The Modern Manufacture of Steel Plate for Shipbuilding. T. F. Pearson. *North East Coast Institution of Engineers & Shipbuilders, Transactions,* v. 72, Feb. 1956, p. 157-182.

Various steel plate manufacturing processes as employed in the shipbuilding industry. Photographs, micrograph, diagrams, graphs, table. 5 ref. (T22, ST)

109-T. Diecastings in the Picture. *Steel,* v. 138, Feb. 13, 1956, p. 95.

Applications of aluminum diecastings in cameras and projectors. Photographs. (T9, E13, Al)

110-T. Porous Chrome Plating for Wear Resistance. Glenn Pendley. *World Oil,* v. 142, Feb. 1956, p. 98, 100.

Characteristics and oil-field applications of a wear resisting chromium surface which has an unusual affinity for lubrication, promising prolonged bearing and liner service life. Photograph, micrographs. (T28, L17, Q9, Cr)

111-T. The Application of Materials in Low Temperature Water and Organic Liquid Cooled Reactors. J. E. Draley and S. Greenberg. Paper from "Nuclear Metallurgy". IMD Series Report No. 2. American Institute of Mining and Metallurgical Engineers, Inc. p. 33-53.

The concepts and philosophy underlying choice of materials for a nuclear reactor illustrated in discussions of pertinent materials. Graphs, photograph, tables. 22 ref. (T25, U, Be, Th, Al)

112-T. Structural Materials for Use in the Pressurized Water Power Reactor. D. M. Wroughton and D. J.

DePaul. Paper from "Nuclear Metallurgy". IMD Special Report Series No. 2. American Institute of Mining and Metallurgical Engineers, Inc., p. 55-69.

The nature of pressurized water reactor systems and problems related to materials selection: corrosion, release of corrosion products to the water, radiation effects, wear, mechanical and physical properties, fabrication. Diagrams, graphs, tables. 7 ref. (T25)

113-T. (Book.) **Nuclear Metallurgy.** R. C. Dalzell, D. H. Gurinsky, R. F. Koenig, E. G. Brush, J. E. Draley, S. Greenberg, D. M. Wroughton, D. J. DePaul, and G. P. Smith. IMD Special Report Series No. 2. 94 p. 1956. American Institute of Mining and Metallurgical Engineers, Inc., 29 West 39th Street, New York 18, N. Y. $3.75.

A report of a symposium covering: application of materials in reactor environments, behavior of materials in aggressive and nonaggressive liquid metals, application of materials in low temperature water and organic liquid cooled reactors, structural materials for use in the pressurized water power reactor, and corrosion of materials in fused hydroxides.
(T25 R6)

V

Materials

General Coverage of Specific Materials

46-V. Aluminum Alloys for Elevated Temperature Service. E. H. Dix, Jr. *Canadian Aeronautical Journal,* v. 2, no. 1, Jan. 1956, p. 11-20.

Data on properties and behavior of one new casting alloy, two new wrought alloys and two aluminum powder metallurgy products, as well as a forging alloy not yet used for airframe structures. Above 600° F. the powder metallurgy products showed marked superiority over any of the conventionally produced alloys. Tables, graphs. 2 ref.
(T24, Al)

47-V. Modern Stainless Steels. *Edgar Allen News,* v. 35, Jan. 1956, p. 12-13.

Chart showing physical and mechanical properties. (SS)

48-V. The Present Status of Titanium Development. D. J. McPherson. *Journal of Metals,* v. 8, Jan. 1956, p. 23-25; disc. 26-30.

Background of alloy development, heat treatment, new alloys, hydrogen problem, forming, casting, cost, performance competition with other new materials or types of structures, potential applications, and availability. Photograph. (Ti)

49-V. Status of Titanium Fabrication and Use. J. H. Garrett. *Journal of Metals,* v. 8, Jan. 1956, p. 30-32; disc. 32-35.

Uses, economic factors, the role of government and possible applications as an aircraft fastener material. (T24, T7, Ti)

50-V. Design Principles in Magnesium. E. V. Schirmer. *Modern Metals,* v. 11, Jan. 1956, p. 46 + 4 pages.

Design considerations, selection of alloy, fabricating, joining and finishing methods, primers, applications, nonporous castings and high-temperature alloy. Diagrams, graphs, photographs. (Mg)

51-V. The Titanium Outlook. D. J. McPherson. *Modern Metals,* v. 11, Jan. 1956, p. 66, 68, 70, 72.

Properties of eight forging-type alloys and three predominantly sheet alloys, applications, design factors, and technical and economic outlook. Table, graphs, photograph. 2 ref. (Ti)

52-V. Super-Purity Aluminium and Its Alloys. F. A. Champion and E. E. Spillett. *Sheet Metal Industries,* v. 33, no. 345, Jan. 1956, p. 25-36; disc., p. 36-38.

Preparation, properties and applications of 99.99% pure aluminum which has a very high resistance to corrosion. Diagram, tables, photographs. 17 ref. (Al)

53-V. Research Results for Higher Manganese Stainless Steels. *Steel Processing,* v. 42, Jan. 1956, p. 42.

Composition and properties of stainless steels developed to conserve nickel supplies, using manganese in place of part of the nickel content of regular stainless steel. There are, as yet, no alloys of this type available to take the place of high-temperature stainless types.
(SS, Mn, Ni)

54-V. Nickel and High-Nickel Alloys for Pressure Vessels. R. M. Wilson, Jr., and W. F. Burchfield. *Welding Journal,* v. 35, Jan. 1956, p. 32S-40S.

Interpretive report prepared for the Materials Division of the Pressure Vessel Research Committee, summarizing data on analysis, properties, method of determining ASME Code design stresses, embrittlement, cold and hot forming, thermal treatments, cleaning, pickling, welding, joining and inspection. Graphs. 1 ref. (T26, Ni)

55-V. How to Get More for Your Stainless Steel Dollar. I. Purchasing. II. Processing. *Iron Age,* v. 177, Feb. 2, 1956, p. 81-96.

Practical principles to follow in purchasing and processing stainless steels for greatest returns. (SS)

56-V. Wrought Aluminum Alloys. Malcolm W. Riley. *Materials & Methods,* v. 43, Jan. 1956, p. 109-124.

Guide to selection and use of wrought aluminum alloys. Available forms and conditions, engineering properties, forming, joining, finishing. Tables, photograph, diagram.
(Al)

57-V. Corrosion Resistance and Mechanical Properties of Cr-Ni-Mn Stainless Steels. R. A. Lula and W. G. Renshaw. *Metal Progress,* v. 69, Feb. 1956, p. 73-77.

The new A.I.S.I. Types 201 and 202 are excellent for many structural applications in corrosive environments. A modified alloy with more chromium and nickel may be necessary to resist the more severe applications in the chemical industry. Graphs, photographs. (SS)

58-V. Zirconium—What Is Its Future? *Nucleonics,* v. 14, Feb. 1956, p. 45-49.

To assess the present status of zirconium as a reactor structural material, a review is presented relating to alloy developments, reduction, fabrication methods and future developments. Tables. 1 ref.
(T26, Zr)

59-V. Zinc and Aluminum Die Casting Alloys. I. Donald L. Colwell. *Precision Metal Molding,* v. 14, Feb. 1956, p. 44-46, 78-79.

Mechanical properties of three zinc-base die casting alloys tested after an aging period of 5 years. Graphs, tables, photograph. 17 ref. (Q general, Zn)

60-V. Zirconium. A Bibliography of Unclassified Report Literature. Hugh E. Voress and Thomas W. Scott, compilers. *U. S. Atomic Energy Commission, TID*-3010 (Suppl. 2), 40 p.

228 annotated references covering the period 1953 to 1955; author, subject, and report number indexes included. (Zr)

61-V. New Carburizing Steels for Critical Gearing. II. R. S. Archer, V. A. Crosby and G. A. Timmons. *Iron Age,* v. 177, Feb. 23, 1956, p. 96-100.

Outstanding results have been obtained in an investigation of a series of new carburizing steels with molybdenum as the principal alloying element. Tables, graphs, micrographs.
(J28, T7, TS, Mo, Mn)

62-V. Designing for Magnesium. E. V. Schirmer. *Machine Design,* v. 28, Feb. 23, 1956, p. 137-140.

Advantages of use of magnesium over aluminum and steel. Graphs, diagrams, photographs.
(Mg, Al)

63-V. (Czech.) **Melting, Effect of Melting and Casting Conditions on the Mechanical Values of Aluminum Bronzes.** Jaromir Nesnidal. *Slévarenstvi,* v. 4, no. 1, Jan. 1956, p. 2-10.

Melting deoxidation and alloying of aluminum bronzes, casting of test specimens and mechanical values obtained from test melts of studied materials. Derives formula for calculation of strength of cast alloys from their chemical composition. Forging, and annealing after forging, of aluminum bronzes. Tables, graphs, diagrams, micrographs.
(C21, Q general, F22, J23, Al, Cu)

64-V. (Polish.) **Technology of Wire Production for Thermo-Electric Elements.** J. Rusz, Z. Misiolek and W. Babinski. *Prace Instytutow Ministerstwa Hutnictwa,* v. 7, nos. 5-6, Dec. 1955, p. 292-301.

Production problems with alloy wire elements. Principles of melting, casting, cold working and heat treatment of these alloys. Tables, graphs. 5 ref.
(F28, T1, SG-q)

65-V. (Book.) **The User Speaks About Magnesium.** Papers individually paged. 1955. Magnesium Association, 122 East 42nd St., New York 17, N. Y.

Twelve papers covering applications, design features, castings, tooling, and magnesium alloys.
(Mg)

66-V. (Book.) **Steels for the User.** R. T. Rolfe. 3rd Rev. Ed. 399 p. 1956. Philosophical Library, Inc., 15 East 40th Street, New York 16, N. Y.

Comprehensive review of properties, requirements, compositions, fabrication, testing, and applications of commercial carbon and alloy steels.
(CN, AY)

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METALLURGICAL ENGINEER: B. S. and graduate work in metallurgical engineering. Age 38. Technical sales, customer service, research, development, administrative experience in melting, casting, heat treating, extrusion, forging and welding of ferrous, light metals and titanium. Originated research projects, wrote technical reports, manuals on production methods, proposals, published articles. Seeks challenging opportunity requiring combination of technical background and ability to relate to people at all levels. Box 4-75.

CHIEF METALLURGIST: Of major airframe manufacturer. Seventeen years experience in all phases of metallurgy as applied to aircraft production, processing, testing, manufacturing research and development. Family, age 38. Box 4-80.

MATERIALS AND STANDARDS ENGINEER: Fifteen years experience with large metalworking company, ferrous and nonferrous materials, in selection and processing of materials for production, cost reduction, and alternates and standardization thereof. Preparation of materials and process specifications. Experienced in high-temperature brazing. Liaison between engineering and manufacturing, all levels. Box 4-105.

METALLURGIST: B. S. in metallurgical engineering. Age 28, veteran, single. Five years experience all phases secondary copper and brass smelting, two years in purchasing and sales. Desires responsible position. Box 4-110.

METALLURGIST: Age 27, married, no children, veteran. B. S. degree. One year experience in research and development of new processes in automotive industry, two years trouble shooting manufacturing difficulties and production failures in tank industry, with one year as section leader of metallurgical laboratory. Two years experience in Army as project engineer testing experimental munitions. Good background in failure analysis, welding problems, heat treatment difficulties and supervision of laboratory personnel. Location Midwest or East. Available June. Box 4-115

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METALLURGICAL ENGINEER: M. Met. E. degree. Eng. Sc. D. degree expected in June. Age 35, single, veteran. Six years industrial and academic experience in research and development, including physical and mechanical metallurgy, toolsteels, corrosion. Desires position in Europe doing applied research or development work. Will consider production. Box 4-95.

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11th Metallographic Exhibit

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(Optical and Electron)

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Class 2. Stainless steels and heat resisting alloys.
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Class 8. Welds and other joining methods.
Class 9. Surface coatings and surface phenomena.
Class 10. Results by unconventional techniques (other than electron micrographs)
Class 11. Slags, inclusions, refractories, cermets and aggregates
Class 12. Color prints in any of the above classes (no transparencies accepted)

Entries are invited in the 11th ASM Metallographic Exhibit, to be held at the National Metal Exposition in Cleveland, Oct. 6 through 12, 1956.

RULES FOR ENTRANTS

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable. Photographic prints should be mounted on stiff cardboard; maximum dimensions 14 by 18 in. (35 by 45 cm.) Heavy, solid frames are unacceptable. Entries should carry a label on the *face* of the mount giving:

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Material, etchant, magnification
Any special information as desired

The name, company affiliation and postal address of the exhibitor should be placed on the *back* of the mount.

Entrants living outside the U. S. A. should send their micrographs by first-class letter mail endorsed "Photo for Exhibition—May be opened for customs inspection".

Exhibits must be delivered before Oct. 1, 1956, either by prepaid express, registered parcel post or first-class letter mail, addressed to:

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AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which, in the opinion of the judges, closely approach the winner in excellence. A Grand Prize, in the form of an engrossed certificate and a money award of $100, will also be awarded the exhibitor whose work is judged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's national headquarters in Cleveland.

All photographs may be retained by the Society for one year and placed in a traveling exhibit to the various Chapters. They will be returned to the owners in May 1957 if so desired.

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